

PROCTER (J.R.)

NOTES

ON THE

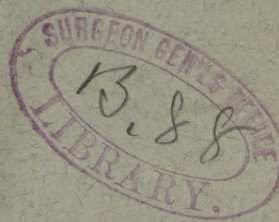
YELLOW FEVER

EPIDEMIC AT HICKMAN, KY.,

DURING THE SUMMER AND AUTUMN OF 1878.

BY JOHN R. PROCTER.

YEOMAN OFFICE—E. H. PORTER, PUBLIC PRINTER.



[Frankfort]
Ky.

GEOLOGICAL SURVEY OF KENTUCKY.

N. S. SHALER, DIRECTOR.

NOTES

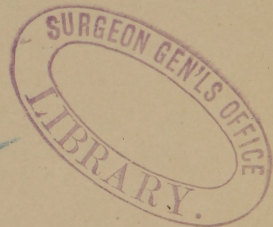
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OFFICE KENTUCKY GEOLOGICAL SURVEY,
FRANKFORT, KY., April 10, 1879. }

To his Excellency, JAMES B. McCREARY, Governor of Kentucky:

SIR: I have the honor to submit herewith the result of observations made, in compliance with your instructions, at Hickman, Kentucky, with reference to the fatal visitation of yellow fever to that place during the summer and autumn of 1878.

Very respectfully,

Your obedient servant,

JOHN R. PROCTER.

NOTES ON THE YELLOW FEVER EPIDEMIC AT HICKMAN, KENTUCKY, 1878.

BY JOHN R. PROCTER.

Hickman, the county seat of Fulton county, Kentucky, a town of about 1,500 inhabitants, is situated in latitude $36^{\circ} 34' 19''$, and longitude $89^{\circ} 11' 42''$, on the eastern bank of the Mississippi river, thirty-eight miles below its confluence with the Ohio river at Cairo.

The Mississippi cuts its shifting course in a flat alluvial plain of from forty to seventy miles in width, extending southward from Cape Girardeau, in Missouri, for more than eight hundred miles, bounded by parallel escarpments of about two hundred feet high. At Columbus, Hickman, Memphis, and Vicksburg the river swings against the western wall of this great plain.

Here the river changes its southward course in a grand sweep to the westward, leaving the Hickman bluff a conspicuous promontory, commanding an extended view of the river and densely wooded plain.

Approaching by river from either direction, the pretty town of Hickman, crowning the hills with shade-embowered residences, and clustering the substantial business houses around the base on the lower level, presents a most attractive scene to the eye, long wearied with the monotonous flatness of the bordering plains.

The bluff presents to the river front a vertical escarpment, the talus at the base sloping into the level of the plain below. From the crest, which at the highest point is two hundred* feet above the low water level, the plateau slopes gradually away to the eastward. These east-

* This elevation is only approximately correct, and was arrived at from the following data: low water at Cairo is given by Ellet ("Ohio and Mississippi Rivers," Philadelphia, 1853) at 275 feet. A survey from Hickman to New Madrid by F. Heller, C. E., made the fall in the Mississippi river 0.5 foot per mile. The level of low water in the Mississippi, at the mouth of the Ohio, was ascertained by Mr. John Childs, engineer of the Mobile and Ohio Railway, to be 275 feet. Low water at St. Louis, as established by survey of Mr. E. Guest, Engineer of the Ohio and Mississippi Railway, is $418\frac{1}{2}$ feet above sea level. This would give an average inclination of $8\frac{1}{2}$ inches per mile between Cairo and St. Louis. Assuming therefrom an inclination of 6 inches per mile between Cairo and Hickman, we get 256 feet as the proper elevation above tide, at low water mark, at Hickman. Ellet places the descent of the Mississippi river below Cairo at 2.8 inches per mile, which would give a greater elevation at Hickman. The levels in the town of Hickman were obtained from careful surveys, made for grading the streets, by F. Heller, and by barometric observations made by myself. The elevations are as much as the contours and figures show on the map. Assuming that the descent is only 2.8 inches per mile, then 10 feet should be added to the elevation of each contour on the map, which would place the top of the bluff 470 feet above sea level.

ern slopes are cut and rounded by the drainage, which is away from the river, into a picturesque topography.

The town is divided into three parts: all west of Obion street being West Hickman; east of Allegheny street, East Hickman; and between those streets, Hickman, which latter division comprises all of the business portion of the town, and many residences on the bluff, as will be seen by reference to the map accompanying this Report.

No place within my knowledge has better natural drainage, or is more cleanly and salubrious, than Hickman on the hills. In West Hickman the drainage is away from the river; so that water falling within a few feet of the river bank drains into a small creek, which, after miles of sluggish wanderings, finds its way into Reelfoot Lake. This sloping of the plain away from the river is a peculiarity of the Mississippi bottom lands. It will be seen, by reference to the contours on the accompanying map, that west Hickman is very level. So, also, is a portion of Hickman. The streets of Hickman are ballasted with a gravel taken from the bluff above the town similar to the gravel used at Paducah, and is the finest street material I have ever seen. The streets are well graded, with gutters on either side, and are always clean. Rains, instead of producing mud, as with our limestone macadamized roads, only wash them the cleaner. In constructing the streets, they were raised several feet higher than the land, and no gutters or *drains under* the streets were provided; so that water falling on the several squares of the town has no escape but by evaporation and sinking into the earth, a method of escape rendered difficult, as we will find on an examination of the formation on which the town is built.

The upper portion of the bluff (see Plate I) is composed of a homogeneous buff-colored silicious loam, from forty to fifty feet thick, known among geologists as the "Bluff" or Loess formation (20 b, of Dana's table of formation), which is, with the exception of the alluvial river bottoms, the most recent of the Kentucky formations. In appearance it resembles a compacted dust, and has by some* been thought to have been formed from the detritus of underlying and neighboring rocks, swept into its present position in the form of dust by atmospheric agencies. Abundant evidences are found at Hickman, and other parts of Western Kentucky where this formation is present, that it is a fluvial or diluvial deposit. Probably owing to the presence of numerous land and fresh water shells (*Helix*, *Cyclostoma Pupa*, *Cyclas*, &c.), this

* See Geology of Mississippi: Jackson, 1857, p. 283.

formation is highly calcareous,* and in the lower part concretions of lime are found.

This bluff loam rests upon a bed of coarse gravel (12 a of the Tennessee Reports, and the equivalent of the "Orange Sand" of the Mississippi Reports), which is about ten feet thick. This gravel underlies the bluff loam, throughout that portion of Kentucky west of the Tennessee river, varying in thickness from a few inches to thirty feet; the pebbles sometimes wanting, and the formation represented only by a thin streak of orange colored sand.

This gravel bed is composed mainly of rounded water-worn pebbles of quartz from the carboniferous conglomerate, and water-worn angular pebbles of chert and hornstone from the Keokuk and Corniferous groups, and coarse angular sand; the entire mass colored and in places cemented with oxide of iron into a massive ferruginous conglomerate sandstone. Intermingled throughout are found numerous silicified fragments of most of the Paleozoic fossils to be found in the Ohio Valley, indicating the origin of this most interesting deposit.

Underneath the gravel bed, there is in many places a pure white sand, marking the division between the Quaternary and Tertiary groups in Western Kentucky.

In descending order are several strata of clay (Eocene Tertiary), both plastic and non-plastic, suitable for pottery, fire-brick, &c. These will be described at length in the Economic Reports of the Geological Survey. The lower portion of the bluff and the slope on which the lower town is situated is composed of a plastic clay of greenish grey color, crumbling when dry into small lumps.†

* The following is an analysis of an averaged sample taken by me from the bluff at Hickman, by Dr. Robert Peter, Chemist of the Geological Survey:

Silica	68.860
Alumina	12.980
Lime	9.687
Iron oxide	2.240
Magnesia	1.182
Potash	1.773
Soda	1.278
Combined water	2.000
	100.000

† The following is the analysis by Dr. Peter from averaged sample. Clay burns a bright buff color, quite hard. Before the blow-pipe quite refractory:

Silica	77.960
Alumina	13.970
Iron oxide	2.390
Lime . . . . .	.134
Magnesia . . . . .	.163
Potash . . . . .	.797
Soda . . . . .	.124
Combined water and loss	4.462
	100.000

When wet, this clay, near the surface of the ground, is tramped into an impervious mass, and in this way the natural seeping of water into the earth is prevented, and the evil effects from lack of surface drainage, caused by the elevation of the streets, are aggravated.

With this general description of the town and its surroundings, we enter the business portion under the bluff, where the fever first made its appearance, for a more careful inspection. On ascending the bank from the steamboat landing to the railway depot (Lot 234, Map; 1, Plate I), we see an open flat square (2, Plate I), extending from Market to Water street, several feet lower than the surrounding streets. The impervious condition of the soil, and the absence of any drainage under the streets, prevents the escape of water falling here, and we are told that here there is in the early spring quite a swamp or pond, which remains until the hot summer's sun dries up the water, and exposes the decayed vegetation beneath it. Under the large building and the platform surrounding it (1, Plate I) the water remains during the entire year, as the sun has no access to it.

Passing up Kentucky street into the town, you notice that portion of the town to the left also very flat, and, in most of the open lots, conditions similar to those just described, prevailing. You remark the cleanly streets and sidewalks and gutters, but on turning westward, on Clinton street, and entering the business houses on the south side of the street, you notice that the back portion of them is dark, owing to the fact that Jackson street is about ten feet higher than Clinton, and many of the business houses extend through to the former street. The walls of most of these are built immediately against the earth; and as they are of ordinary brick, and no hydraulic lime used in their construction, the dampness has penetrated through, in many instances rotting off the plastering, and discoloring it for several feet above the level of the street. Few of these houses are provided with cellars, and as the floors are placed near the ground, with no provision for a free circulation of air under them, the floor timbers soon decay, and require renewing every few years. I saw one floor of yellow pine, put down not longer than twelve months, showing evidences of advanced decay. Where the houses do not extend through to Jackson street, small yards have been excavated back to the sidewalk on a level with the lower floors, and in these yards are the privies for the use of the occupants of the stores and dwellings, and in some instances cisterns from which water is used for drinking and culinary purposes. We can see no drains from these yards

or under the houses. These conditions prevail from Kentucky to Union street. Our chief business is with the square bounded by Jackson, Kentucky, Carroll, and Cumberland streets, for here were the first cases of yellow fever.

The one story frame building (G, Plate I) was the residence of Mr. Hendricks, and it was here that Charlie Hendricks was attacked with fever on August 12th, and his sister Louisa on the following day. Owing to the natural slope of the ground, the lower side of the house is about six feet above the ground, and the upper side rests on the ground, the earth being eighteen inches higher than the porch floor. The sanitary condition of this house is better than other houses on this square, and in the lower part of the town. It is well drained, and during the month of August the surroundings were dry and reasonably cleanly. The privy (H, Plate I) is several feet above the level of the floor of this house, and we can see no reason why the washings from the same should not be carried by hard rains under the floors of the rear portion of the house. South of H is another privy about five feet higher; to neither of these is there a vault. The dotted line (references are all to Plate I), extending from the Hendricks house to Kentucky street, is an embankment of about five feet high, between which and Jackson street the ground is perfectly flat. The slope from the top of this embankment to Carroll street may be seen in section accompanying Plate I. The two privies (F) at the northeast corner of the Hendricks house have no pits, and we see the excrement is banked up for two feet or more above the top of the ground. The tank (31) at the back of the cooper shop, used for soaking hoops, is filled with foul water. The square plank building (E) is a stable, and was used as such during the summer of 1878; the drippings from the roof running in on the floor, so that it was never very dry. At (29), between the two frame houses, there is a space of about twelve inches, into which leaves and some garbage has drifted. The drippings from the roof—there being no gutters—fall into this space, and the studding and weatherboards of either house is damp and rotten for eighteen inches above the ground. The floors of some of these houses have sunken below the level of the ground, and there is nothing to prevent the wash from the yards running on to them. This is notably the case with the floor of the house at (15). There is a cistern (28) from which I took water analysis. (See Appendix A.)

The privy at (27) is the only one noted on this square with a vault. This is filled with excrement to the top; and there being no drain from

it, I am informed that sometimes, during very hard rains, the contents of this vault is floated out of its resting place. The old stable shed at (14) has a floor of planks resting on the earth, which floor is rotten and foul. The cistern (26) is filled with water so impure that it has not been used for some time. The cistern at (25) is used for drinking and household purposes. Around this is a favorite place for the casting of slops. The back portion of the building (13) has sunken several inches into the ground, and the washings must necessarily be carried by rains upon the floor of one of the rooms. The privy (23) is banked up several feet above the ground, and also another (24) on the upper terrace. The cisterns (21 and 22) are very much used for drinking water. The yard around receives the drainage from the upper portion of the lot. I notice, also, that the negro women engaged in washing clothes empty the dirty slops around and within a few feet of the cisterns. These waters were sampled for analyses.* The earth on this square is perfectly saturated with organic matter. Under the large frame house (Lot 15, Map; 13, Plate I), known as the City Hotel, used as a tenement house by negroes, there is an excavation of several feet in depth, from which there is no drain. Consequently it is nearly filled with the washings from the lot, and such garbage as the occupants may choose to cast out of sight. Water stands in this place the entire year. During the hot months of summer this becomes a favorite loafing place for the city hogs; and I am informed that, upon emerging, they were redolent with the perfumes of this cool retreat. Upon taking some of the contents from this pit in November, I found that the frosts, and a large quantity of lime which had been thrown into it, had not altogether deprived it of an offensive odor. These conditions were probably aggravated by the intense heat of the summer of 1878.† I cannot find that there had been any unusual amount of malarial or other fevers previous to August.

* For analyses of these cistern waters, and interesting notes by Dr. Peter on Contamination of Waters, see Appendix A.

† Statement showing the *mean temperature* for the months of June, July, August, September, and October at Cairo, Illinois, and Memphis, Tennessee, compiled from the records on file at the Office of the Chief Signal Officer, Washington, D. C.

DATE—1878.	MEAN TEMPERATURE.	
	Cairo.	Memphis.
June.	76.4	73.9
July.	83.7	82.7
August.	82.1	81.2
September.	72.0	70.6
October.	61.3	59.0

From the above the mean monthly temperature at Hickman can be approximately arrived at. It will be observed, by comparison with other years, that this was a summer of almost unprecedented heat.

REFERENCES TO PLATE I.

1. Railway Depot and Telegraph Office: marsh under large Building.
2. Open Lot, flat and marshy.
3. Fulton House (lot No. 10 map); eleven cases of fever and four deaths in this house.
(See tabulated statement of cases, page 14.)
4. Thos. Gleeson's residence; three cases and one death. (See page 13)
5. Blacksmith Shop; A. Seymour and Gustave Hunzacker, and all of the negro hands, attacked early. (See No. 20, page 12, tabulated statement.)
6. A. Young; every member of family (seven in number) had fever; five died. (See Nos. 21 to 27, page 12.)
7. Livery Stable; occupants left early.
8. Occupants left early.
9. Six cases and two deaths. (Nos. 10 to 15, page 12)
10. Five cases (negroes); all recovered; probably the first case among the negroes was in this house.
11. Four cases (negroes); no deaths.
- 12 and 13. Negroes; nearly, if not all, had fever; 13 is where the Band practiced. (See page 13.)
14. Old Stable Shed
15. Tenement-house, occupied by negroes; all remaining, had fever.
17. Every member of family—six—died. (See No. 30, page 13.)
18. Sampse & Son, furniture store; both died; other stores on block vacated early.
19. Reed family occupied second floor. (See Nos. 105-'6-'7 and Appendix C.
20. Mangel's Bakery. (See Nos. 7, 8, and 9 and No. 57; also see reference, page 9.)
- 21, 22, 25, 26, 28. Cisterns.
31. Tank back of Cooper Shop
 - A. (Plat and section) Drug Store; only clerks remaining died (See No. 95, page 14.)
 - B. N. P. Harness & Co., Hardware Store; he died. (See No. 41.) Partner and clerks left early and escaped.
 - C. Occupied as offices; Dr. Catlett's office was in this building, on ground floor, rear portion.
 - D. Undertakers and E. D. Case's Cooper Shop. (See No. 16, page 12)
 - E. Stable; very damp and unwholesome.
 - G. Hendrick's House, where first case occurred; six cases and five deaths in this house.
(See No. 1, page 12.)
 - K. Stable and Pig-sty.



The town authorities, alarmed at the northward spread of yellow fever, had established a quarantine, but the enforcement of it had been neglected or it had been withdrawn, and steamboats from the infected district were allowed to land.

On August 3d the steamer Golden Crown landed at the public wharf, and put off a buggy inclosed in a wooden box. On July 27th* the John D. Porter came near shore, opposite Obion street, to take in tow a barge. At the time the *wind was blowing hard on shore*, so that the boat could not run to shore with safety, and one end of the barge was swung out into the stream until it could be grappled by the boat. Whilst this was occurring a yawl containing three men pulled up from the boat to the wharf. The men leaving the boat went up to the telegraph office, and it is asserted that two of them went to Mangel's bakery (Lot No. 5, Map; 20, Plate I. See also Nos. 7, 8, and 9, tabulated statement of cases). On returning to the wharf, the men waited some minutes on the wharf-boat for the Porter to come up, when they pulled out to the boat and were taken on board. This would indicate that the Porter remained for twenty or thirty minutes in front of the town.

The steamer Golden Rule landed at the wharf-boat August 16th and discharged some freight, then dropped to the lower landing, below Obion street, to coal, where she was detained long enough to allow many of the passengers to go on shore and stroll about the town. No one from Hickman went on board of the John D. Porter. The children, Charlie and Louisa Hendricks, peddled apples on steamboats landing at Hickman, and about the wharf-boat. It is asserted by Mr. Hendricks, their father, that they went on board the steamers Golden Crown and Golden Rule. The history of yellow fever on the ill-fated John D. Porter is well known. Yellow fever developed on the Golden Rule as early as August 18th, possibly earlier. Six cases were admitted from this boat in the Cincinnati Hospital, two of which died.†

In the John D. Porter and Golden Rule we have two possible means by which the yellow fever may have been conveyed to Hickman. On August 12th, the first case of yellow fever (Charlie Hendricks) occurred,

* The evidence collected in Hickman from Mr. Overton, the wharfmaster and others, August 5th, was given as the date of the arrival of the Porter. I am certain they were mistaken either in the boat or in the date. I have been at some pains to collect the facts respecting the Porter, which I give in Appendix B, where also will be found some important facts connected with the Golden Crown and Golden Rule and other boats from New Orleans. Mr. Overton and others were also of the opinion that the Golden Rule landed August 10. This could not be the date, as the boat left New Orleans on August 10, and arrived at Cairo at 4 P. M., August 16.

† For history of these cases, see Dr. Minor's report on "The Yellow Fever in Ohio," pp. 45-'6-'7.

followed by his sister Louisa. There was a lull, and no other cases appeared until August 20th. (No. 55.*)

On August 24th, 3 new cases (Nos. 71, 121, 196).

On August 25th, 5 new cases (Nos. 8, 10, 44, 135, 237).

On August 26th, 2 new cases (Nos. 37, 42).

On August 27th, 6 new cases (Nos. 11, 38, 51, 52, 56, 122).

On August 28th, 9 new cases (Nos. 3, 16, 19, 20, 36, 41, 68, 149, 189).

On August 29th, 8 new cases (Nos. 18, 21, 28, 30, 35, 39, 59, 64).

On August 30th, 4 new cases (Nos. 9, 53, 57, 65).

On August 31st, 5 new cases (Nos. 43, 54, 55, 58, 62).

Some of the young men of Hickman had organized a brass band, and they were in the habit of practicing at a room in the old City Hotel property. (Lot 31, Map; 13, Plate I.) It is worthy of note, that of the six members of this band five were attacked with yellow fever between August 27th and 29th. I was informed by a member of this band that many children of the town were in the habit of standing around this house at night listening to the music. Among the number he remembers the Hendricks children, and Joe Baltzer and Jimmie Young. It will be noticed that the two latter were attacked also August 29th. (See Nos. 29 and 33.)

I have, in the following tabulated statement, given only the cases occurring among the whites. As fewer of the negroes left the town and most of them resided in the lower part, it is believed there were as many cases of fever among them; but the difficulty of obtaining reliable information precluded the statement of cases. It is noteworthy the small percentage of deaths among the negroes. It is thought by those in Hickman best informed on the subject, that there were as many yellow fever cases among the negroes as among the whites; yet there were only eighteen deaths. I have in the following tables a report of 262 cases among the whites. Assuming the same number among the negroes, the deaths would be a little over 7 per cent., whilst 50 per cent. of the whites died.

In preparing the following tables, several cases reported as yellow fever have been excluded, because doubts were expressed by persons best acquainted with the circumstances.

This statement of cases is necessarily imperfect, owing to the fact that no record was kept of fever cases occurring. All of the resident physi-

* Numbers refer to first column tabulated statement of cases, pp. 12 to 21.

cians died but one (Dr. A. A. Faris), and he had the fever. It has, therefore, been difficult to get much information wanted to make complete a statement of this kind.

I have been greatly assisted in this by Hon. Henry A. Tyler, who was in Hickman daily during the epidemic, and by F. E. Case, who kept a record of deaths.

The arrangement which I have adopted in the following tables, it is thought, will best enable persons to study the spread of the disease with reference to the map accompanying this Report. It must be borne in mind that the lots are wide enough to often contain more than one house; so that where two families are located on the same lot it is not to be inferred that they occupy the same house. Families are grouped as much as possible.

The following table, compiled from authentic sources, will give percentage of deaths, from which comparison can be made :

	CASES.			DEATHS			Percentage of deaths—Whites.	Percentage of deaths—Colored.	Percentage of deaths—Total.
	White.	Colored.	Total.	White.	Colored.	Total.			
New Orleans.	14,008*	1,710*	18,576	3,863	183	4,046	27.5	10.	21.8
Vicksburg.	3,500†	3,000†	6,500	721	267	988	20.6	8.9	15.2
Memphis	6,000‡	9,000‡	14,000	4,000‡	1,130‡	5,130	66.6	12.5	36.6
Grenada and vicinity .	1,092	400	1,492	368	39	407	33.6	9.7	27.4
Jackson, Miss.	173	317	490	49	35	84	28.3	10.	17.2
Hickman, Ky.	262	200‡	149	131	18	149	50.	9.	32.2

* Whole number of cases classified; thought by some there were as many as 23,000 cases.

† Estimated.

‡ About: the death list is from names published by the Howard Association.

§ Estimated.

The following abbreviations have been used in the tables: E. H., East Hickman; B. A., Balder's Addition, East Hickman; G. A., Golder's Addition, East Hickman; V. L., Vicinity Lot, East Hickman; W. H., West Hickman.

TABULATED STATEMENT OF YELLOW FEVER CASES AT HICKMAN, KENTUCKY.

No.	NAME.	Age.	Residence, No. of Lot.	Place of Business No. of Lot.	Date of Attack by Fever.	Date of Death	Remarks.
1	Hendricks, Charlie . . .	13	44	Aug. 12 . .	Aug. 16 . .	It is supposed that the Hendricks children peddled apples on the Golden Crown and Golden Rule. They were not on board the John D. Porter.
2	Hendricks, Louisa . . .	6	44	. . . . .	Aug. 13(?) .	Aug. 17 . .
3	Hendricks, Mrs. . . .	45	44	. . . . .	Aug. 28 . .	Sep. 3 . .
4	Hendricks, Annie . . .	10	44	. . . . .	Sep. 1 . .	Sep. 6 . .
5	Hendricks, John . . .	17	44	. . . . .	Sep. 14 . .	Sep. 20 . .
6	Hendricks, Mr. . . .	50	44	. . . . .	Sep. 18 . .	Recovered.
7	Mangel, Edward . . .	49	5	5	Aug. 24 . .	Aug. 28 . .	Two small children escaped attack. (See Sohm's family, No. 98.)
8	Mangel, Mrs. E. . . .	40	5	5	Aug. 25 . .	Sep. 5 . .	
9	Mangel, George . . .	15	5	5	Aug. 30 . .	Recovered.	(See R. J. Reid's family, No. 105.)
10	Roulhac, Mrs. H. . . .	40	42	. . . . .	Aug. 25 . .	Recovered.
11	Roulhac, George . . .	21	42	29	Sep. 27 . .	Oct. 2 . .	MEMBER OF THE BAND.
12	Millet, John	64	42	. . . . .	Sep. 5 . .	Sep. 11 . .
13	Millet, Miss Rose . . .	35	42	Sep. 4 . .	Recovered.	Mrs. John Millet, the only person in house who escaped attack; she had yellow fever in 1832 in New Orleans.
14	Millet, Marve	28	42	. . . . .	Sep. 6 . .	Recovered.
15	Millet, Melvin	28	42	Sep. 13 . .	Recovered.	MEMBER OF THE BAND. Sick at his father's house in West Hickman, where he came in contact with the family. Family escaped attack.
16	Case, F. E.	25	West Hick'n	29	Aug. 28 . .	Recovered.	
17	Holt, R. D.	40	West Hick'n	3	Sep. 13 . .	Sep. 16 . .	Also resided in Mr. Case's family; removed to Hospital; came in contact with Case's family.
18	Hancock, W.	27	195	. . . . .	Aug. 29 . .	Sep. 2 . .
19	Buckner, W. F., jr. . .	20	L. 3 Br E. H	Aug. 28 . .	Sep. 3 . .	MEMBER OF THE BAND. See Bondurant family (No. 212), where he resided; family went to vicinity of lot 124 on September 1.
20	Hunzacker, Gustave . .	27	17	T. & S. B. S. S.	Aug. 28 . .	Recovered.	
21	Young, Jimmie	12	40	Aug. 29 . .	Aug. 30 . .	MEMBER OF THE BAND. Boarded with Seagrist's family.
22	Young, Mrs. Ab. . . .	36	40	. . . . .	Sep. 8 . .	Sep. 13 . .
23	Young, Abner	38	40	Porter Ex. Co	Sep. 11 . .	Sep. 16 . .	Only one member of family escaped attack—a boy three years old.
24	Young, Mrs. Nancy . .	60	40	. . . . .	Sep. 5 . .	Sep. 17 . .
25	Young, William	16	40	Sep. 12 . .	Recovered.	See reference to Jimmie Young, page 80.
26	Young, Johnnie	10	40	. . . . .	Sep. 15 . .	Recovered.
27	Young, Ellen	18	40	Sep. 17 . .	Sep. 20 . .	

28	Baltzer, George	9	121	Aug. 29	Recovered.	See reference to Geo. Baltzer, page 80.
29	Baltzer, Phil.	39	121	Sep. 12	Sep. 17.	
30	Seagrist, Mrs. Frank	29	17	Aug. 29	Sep. 3	No member of family escaped.
31	Seagrist, Frank.	45	17	Sep. 10	Sep. 14.	
32	Seagrist, Otto	3	17	Sep. 13	Sep. 13.	
33	Whal, Miss E.	30	17	Sep. 13	Sep. 17.	
34	Eckert, Miss L.	18	17	Sep. 13	Sep. 17.	
35	Davis, Gus.	30	89	Aug. 29	Sep. 1	Cook and house-maid in Seagrist's family.
36	Davis, Lula	11	89	Aug. 28	Sep. 3.	Remainder of family after the deaths fled and escaped attack.
37	Gleeson, Mrs.	36	16	Aug. 26	Recovered.	
38	Gleeson, Thos. E.	50	16	Aug. 27	Recovered.	
39	Gleeson, Hallie	2	16	Aug. 29	Sep. 3.	
40	Young, W. E.	..	16	Sep. 11	Recovered.	
41	Harness, N. P.	41	49	Aug. 28	Sep. 4	Family fled after his death, and escaped attack.
42	Simones, John	44	116	Aug. 26	Sep. 5	Remainder of family fled after his death, and escaped attack.
43	Simones, Mary	15	116	Aug. 31	Recovered.	Visited the Hendricks children (lot 44) August 17, during sickness and after death of two.
44	Witting, Mrs. John.	36	186	Aug. 25	Aug. 29	
45	Witting, John	54	186	Sep. 18	Recovered.	
46	Witting, Henry	2	186	Sep. 19	Sep. 22	
47	Witting, Joseph	14	186	Sep. 20	Recovered.	
48	Witting, Clara	18	186	Sep. 25	Recovered.	
49	Witting, Annie.	20	186	Sep. 22	Recovered.	
50	Witting, Katie	4	186	Sep. 22	Recovered.	
51	Heatherly, Mac.	17	West Hick'n	Aug. 27	Sep. 1	Fisherman; about the river a great deal; family left after his death, and escaped attack.
52	Puckett, Geo. W.	68	Country	Aug. 27	Sep. 5	Seven miles in country; was in Hickman attending court previous to his attack; died in country; family escaped attack.
53	Coffee, William	17	V. L. 92 E. H	Aug. 30	Sep. 3	Family fled after his death, and escaped attack.
54	Funk, F.	28	110	Aug. 31	Sep. 5	Removed with family to suburbs August 28; family fled after his death and escaped.
55	Slaughter, —	23	101-2	Aug. 31	Recovered	Boarded at Planters' House (lots Nos. 101 and 102), where she was sick. (See No. 205.)
56	Bright, David	25	197	Aug. 27	Sep. 9	After his attack family where he boarded fled and escaped attack.
57	Gibbs, F.	42	2 (suburbs)	Aug. 30	Sep. 3	Carpenter; reported to have repaired the floor in Ed. Mangel's house (see No. 7) August 15 to 20; seven in family; two escaped attack.
58	Gibbs, Emily	9	2 (suburbs)	Aug. 31	Recovered.	
59	Gibbs, Minnie	11	2 (suburbs)	Aug. 29	Recovered.	
60	Gibbs, Mrs. F.	30	2 (suburbs)	Sep. 5	Recovered.	
61	Gibbs, Earnest	1	2 (suburbs)	Sep. 15	Recovered.	

TABULATED STATEMENT OF YELLOW FEVER CASES AT HICKMAN, KENTUCKY—Continued.

No.	NAME.	Age.	Residence, No. of lot.	Place of Business No. of lot.	Date of Attack by Fever.	Date of Death.	Remarks.
62	Gardner, Mattie.	10	194	.	Aug. 31 . .	Recovered.	Not in lower town previous to attack, it is asserted. Was down in lower town a week before the attack; after her death family fled and escaped attack. Clerk with R. O. Luttrell. (See No. 228)
63	Gardner, Mrs. W. H.	32	194	.	Sep. 1 . .	Sep. 6 . .	
64	Dunovant, George . .	26	24	4	Aug. 29 . .	Sep. 7 . .	
65	Buncho, Miss	16	27	27	Aug. 20 . .	Recovered.	Peddled apples on boats. Keeping hotel (Fulton House).
66	Buncho, Mrs.	57	27	27	Sep. 3 . .	Recovered.	
67	Buncho, Andy	64	27	27	Sep. 14 . .	Sep. 19 . .	
68	Betts, John	14	10	.	Aug. 28 . .	Recovered.	[death, and escaped. Had been nursing the sick; family fled after his After his death family fled and escaped. An only child of Mrs. Barnes escaped attack. Was in town shortly before attack.
69	Betts (McCane), John .	25	10	10	Sep. 3 . .	Sep. 6 . .	
70	Betts, Sallie	9	10	10	Sep. 13 . .	Recovered.	
71	Betts, Mrs.	49	10	10	Sep. 14 . .	Recovered.	[death, and escaped. Had been nursing the sick; family fled after his After his death family fled and escaped. An only child of Mrs. Barnes escaped attack. Was in town shortly before attack.
72	Betts, George	11	10	.	Sep. 14 . .	Recovered.	
73	Ray, Nelson M. . . . .	.	10	.	Sep. 7 . .	Recovered.
74	Kingman, A. D., jr. . .	20	62	.	Sep. 1 . .	Sep. 6 . .	[death, and escaped. Had been nursing the sick; family fled after his After his death family fled and escaped. An only child of Mrs. Barnes escaped attack. Was in town shortly before attack.
75	Myer, Stephen	29	192 W. H.	Drayman .	Sep. 2 . .	Sep. 8 . .	
76	Barnes, Mrs. J. D. . .	25	88	.	Sep. 4 . .	Recovered.	
77	Barnes, J. D.	31	88	.	Sep. 8 . .	Sep. 14 . .	[death, and escaped. Had been nursing the sick; family fled after his After his death family fled and escaped. An only child of Mrs. Barnes escaped attack. Was in town shortly before attack.
78	Barnes, William . . .	40	Country . .	4	Sep. 10 . .	Sep. 15 . .	
79	Samse, Augusta	17	178	.	Sep. 1 . .	Recovered.	
80	Samse, Herman	9	178	.	Sep. 5 . .	Recovered.	[death, and escaped. Had been nursing the sick; family fled after his After his death family fled and escaped. An only child of Mrs. Barnes escaped attack. Was in town shortly before attack.
81	Samse, Henry	19	178	.	Sep. 9 . .	Sep. 14 . .	
82	Samse, Fritz	49	178	Undertaker.	Sep. 9 . .	Sep. 16 . .	
83	Samse, Charlie	13	178	.	Sep. 13 . .	Sep. 17 . .	[death, and escaped. Had been nursing the sick; family fled after his After his death family fled and escaped. An only child of Mrs. Barnes escaped attack. Was in town shortly before attack.
84	Samse, Ida	4	178	.	Sep. 29 . .	Oct. 2 . .	
85	Samse, William	7	178	.	Sep. 30 . .	Recovered.	
86	Samse, Mrs. Fritz . . .	33	178	.	Oct. 4 . .	Oct. 10 . .	[death, and escaped. Had been nursing the sick; family fled after his After his death family fled and escaped. An only child of Mrs. Barnes escaped attack. Was in town shortly before attack.
87	Frick, Mrs. Louisa . .	73	178	.	Sep. 22 . .	Recovered.	
88	Nugg, Annie	17	178	.	Sep. 5 . .	Recovered.	
89	Miller, Mrs. Frank . .	40	47	.	Sep. 4 . .	Sep. 9 . .	[death, and escaped. Had been nursing the sick; family fled after his After his death family fled and escaped. An only child of Mrs. Barnes escaped attack. Was in town shortly before attack.
90	Miller, Frank	45	47	.	Sep. 11 . .	Sep. 16 . .	
91	Miller, Joseph	59	47	.	Sep. 18 . .	Sep. 22 . .	
92	Miller, Fenia	18	47	.	Sep. 1 . .	Recovered.	[death, and escaped. Had been nursing the sick; family fled after his After his death family fled and escaped. An only child of Mrs. Barnes escaped attack. Was in town shortly before attack.
93	Miller, Clara	16	47	.	Sep. 6 . .	Recovered.	
94	Miller, Frank	10	47	.	Sep. 20 . .	Recovered.	

95	Ashworth, Ben.	21	247 W. H.	6	Sep. 6 . .	Sep. 11 .	Had not been in town during epidemic.
96	Hackett, Mrs. C.	26	247 W. H.	Chief Police	Sep. 10 . .	Recovered.	Assisted in nursing the sick; two children in same house escaped attack.
97	Hackett, Charles	26	247 W. H.	10	Oct. 1 . .	Recovered.	Was in lower town before attacked.
98	Sohm, Miss E.	19	2 (suburbs)	10	Sep. 7 . .	Sep. 12 . .	Was in lower town before attacked.
99	Sohm, Willie.	7	2 (suburbs)	10	Sep. 7 . .	Sep. 14 . .	States she was not in lower town previous to attack.
100	Sohm, Louisa	13	2 (suburbs)	10	Sep. 9 . .	Recovered.	Had not been in lower town since August 17.
101	Sohm, Casper	55	2 (suburbs)	10	Sep. 11 . .	Sep. 13 . .	Had not been in lower town since August 17.
102	Sohm, Mrs. Casper	52	2 (suburbs)	10	Sep. 11 . .	Recovered.	Was in lower town before attack [On September 4 a little daughter of Mrs. Hendricks' (see No. 3) was taken to Casper Sohms' for protection, and remained in Sohms' family. This child escaped attack
103	Sohm, John	5	2 (suburbs)	10	Oct. 5 . .	Oct. 14 . .	Removed after attack to residence of Dr. A. A. Paris.
104	Fortune, B. W.	33	Com'l Hotel	R. R. Depot	Sep. 7 . .	Sep. 11 . .	Reid and family left early after the attack of Mangel (family occupied the second floor of Mangel's house) for Nashville, where they had the fever and child died.
105	Reid, Mrs. R. J.	24	5	5	Sep. 7 . .	Recovered.	Family left September 3d, and escaped attack.
106	Reid, R. J.	34	5	5	Sep. 9 . .	Recovered.	Mrs. Amberg and son left for Cincinnati the day after Mr. Amberg's death; son escaped; Mrs. A. had fever in Cincinnati; see Dr. Minor's report, page 75.
107	Reid, R. J., jr.	3	5	5	Sep. 13 . .	Sep. 16 . .	Family left after his death and escaped attack.
108	Blanton, Dr. C.	50	360	Attend'g sick	Sep. 8 . .	Sep. 13 . .	
109	Amberg, Joseph	59	85	2	Sep. 3 . .	Sep. 25 .	
110	Amberg, Irene	30	85	2	Sep. 10 . .	Sep. 14 .	
111	Amberg, Vickie	23	85	2	Sep. 18 . .	Sep. 25 .	
112	Amberg, Mrs. J.	56	85	2	Sep. 30 . .	Recovered.	
113	Frenz, William	31	85	2	Sep. 15 . .	Sep. 21 .	
114	Catlett, Dr. H. C.	67	305 W. H.	Attend'g sick	Sep. 11 . .	Sep. 16 . .	
115	Hertwick, Mattie.	11	120	2	Sep. 11 . .	Recovered.	
116	Hertwick, Ed.	6	120	2	Sep. 11 . .	Recovered.	
117	Hertwick, John	3	120	2	Sep. 11 . .	Recovered.	
118	Hertwick, Max	9	120	2	Sep. 12 . .	Recovered.	
119	Hertwick, Mrs. M.	31	120	2	Sep. 12 . .	? ?	
120	Hertwick, Max	42	120	13	Sep. 14 . .	Sep. 18 . .	A son 2 year old escaped attack.
121	Person, Mr.	223	223	2	Sep. 14 . .	Recovered.	Mrs. Person had bilious fever as early as August 8, and escaped attack.
122	Person, Louis	45	223	2	Aug. 24 . .	Recovered.	
123	Person, Harry	19	223	2	Aug. 27 . .	Recovered.	
124	Person, Louis	10	223	2	Sep. 18 . .	Recovered.	
125	Person, Louisa	6	223	2	Sep. 22 . .	Sep. 27 .	
126	Halyburton, Mrs. Cora	24	162	2	Sep. 1 . .	Sep. 15 . .	Went with husband and son to Louisville, where she and son died; husband escaped attack.
127	Halyburton, infant son	2m	162	2	Sep. 1 . .	Sep. 15 .	
	Nelson, N. L.	51	103	103	Sep. 11 . .	Sep. 14 .	

TABULATED STATEMENT OF YELLOW FEVER CASES AT HICKMAN, KENTUCKY—Continued.

No.	NAME	Age.	Residence, No. of Lot.	Place of Business, No. of Lot.	Date of Attack by Fever.	Date of Death.	Remarks.
128	Nelson, Mrs. N. L. . .	33	103	103	Sep. 7 . .	Sep. 15 . .	One child escaped attack.
129	Nelson, Mattie. . .	4	103	. . . . .	Sep. 11 . .	Recovered.	
130	Stoner, Mrs. Fred. . .	17	10	94	Sep. 5 . .	Recovered.	Confined in jail (lot 94).
131	Stoner, Fred.	25	10	13	Sep. 14 . .	Sep. 16 . .	
132	Kesterson, E. H. . . .	34	94	94	Oct. 5 . .	Oct. 10 . .	In town frequently before attack.
133	Stoner, Mrs. Kate . .	70	94	94	Oct. 5 . .	Oct. 11 . .	
134	Smith, O. P.	48	8, 9, 10, W. H.	. . . . .	Sep. 11 . .	Sep. 15 . .	One son escaped attack.
135	Smith, Kate . . . . .	. .	8, 9, 10, W. H.	. . . . .	Aug. 25 . .	Recovered.	
136	Smith, Ed. . . . .	. .	8, 9, 10, W. H.	. . . . .	Oct. 1 . .	Recovered.	See Bondurant family, No. 216.
137	Smith, Mrs. O. P. . .	. .	8, 9, 10, W. H.	. . . . .	Oct. 13 . .	Recovered.	
138	Bayless, Edgar	16	195 & 124 E. H.	. . . . .	Sep. 10 . .	Sep. 15 . .	No family, see Nos. 51, 52.
139	Petham, W. T.	3	Country . .	. . . . .	Sep. 13 . .	Sep. 15 . .	
140	Dozier, T. C.	38	194	Nursing sick	Sep. 12 . .	Sep. 16 . .	At beginning of epidemic took family to Dr. Alexander's; he returned to Hickman during the day; family escaped attack. (See Dr. Alexander, No. 245).
141	Brevard, W. A.	49	366	. . . . .	Sep. 10 . .	Sep. 16 . .	
142	Prather, Dr. R. C. . . .	27	188	Attend'g sick	Sep. 12 . .	Sep. 18 . .	Family sent to country September 19 and escaped.
143	Prather, Dr. H. L. . .	23	188	Attend'g sick	Sep. 21 . .	Sep. 27 . .	
144	Prather, Mrs. R. C. . .	22	188	. . . . .	Sep. 23 . .	Recovered.	Returned to his home in Missouri after death of his brother (Dr. R. C. P.), where he died.
145	Scharfe, Mrs. E. . . .	36	24	. . . . .	Sep. 12 . .	Recovered.	
146	Scharfe, Ida	13	24	. . . . .	Sep. 20 . .	Recovered.	Mrs. P returned to Hickman during the day to visit her husband; had fever in country; family in country escaped attack.
147	Scharfe, I.	71	24	. . . . .	Sep. 29 . .	Recovered.	
148	Scharfe, E.	42	24	24	Sep. 20 . .	Sep. 23 . .	Removed to Dr. Catlett's residence, 305 West Hickman, on September 23, where they remained during illness.
149	Jones, Mrs. T. M. . . .	30	255 B. 2 E. H.	. . . . .	Sep. 20 . .	Recovered.	
150	Jones, T. M.	37	255 B. 2 E. H.	. . . . .	Aug. 28 . .	Sep. 22 . .	Had been to town previous to attack.
151	Parker, Alice	24	255 B. 2 E. H.	. . . . .	Sep. 16 . .	Recovered.	
152	Freedle, George	35	Nurse in hospital.	. . . . .	Oct. 8 . .	Recovered.	Had not been to town previous to September 25, on which date she went to town, and took the train for Nashville.
							When attacked removed to lot No. 219, West Hickman.

153	May, Mrs. James . . .	28	38	. . . . .	Sep. 8 . .	Recovered.
154	May, James	38	38	. . . . .	Sep. 10 . .	Recovered.
155	May	10	38	. . . . .	Sep. 11 . .	Recovered.
156	May } children	6	38	. . . . .	Sep. 12 . .	Recovered.
157	May }	2	38	. . . . .	Sep. 13 . .	Recovered.
158	Stover, Thos.	22	Express mess	enger at R.R.	Sep. 10 . .	Recovered.
159	Berger, Herman . . .	20	204 W. H.	. . . . .	Sep. 11 . .	Sep. 18 . .
160	Berger, J. G.	60	204 W. H.	. . . . .	Sep. 25 . .	Oct. 1 . .
161	Berger, Mrs. J. G. . .	54	204 W. H.	. . . . .	Oct. 1 . .	Oct. 10 . .
162	Rose, Laura	16	91	. . . . .	Sep. 9 . .	Recovered.
163	Shoemaker, John. . . .	47	Attending si	ck at hospital	Sep. 13 . .	Sep. 17 . .
164	Thomas, Gus.	16	223 W. H.	. . . . .	Sep. 10 . .	Recovered.
165	Thomas, Jas. C.	24	223 W. H.	. . . . . 5	Sep. 15 . .	Sep. 20 . .
166	Thomas, Thad. W. . . .	45	223 W. H.	. . . . .	Oct. 1 . .	Oct. 2 . .
167	Thomas, Sallie	19	223 W. H.	. . . . .	Oct. 13 . .	Oct. 18 . .
168	Thomas, Mrs. Mary. . .	42	223 W. H.	. . . . .	Oct. 19 . .	Oct. 24 . .
169	Karher, Charles	38	On the hill.	. . . . .	Sep. 14 . .	. . . . .
170	Karher, Mary	2 m	On the hill.	. . . . .	Sep. 10 . .	Sep. 24 . .
171	Karher, Josephine . . .	2 m	On the hill.	. . . . .	Sep. 25 . .	Sep. 24 . .
172	Karher, Eva	38	On the hill.	. . . . .	Sep. 25 . .	Oct. 9 . .
173	Karher, Henry	14	On the hill.	. . . . .	Sep. 22 . .	Recovered.
174	Karher, Frank. . . . .	. . .	On the hill.	. . . . .	Sep. 28 . .	Recovered.
175	Karher, Annie . . . . .	. . .	On the hill.	. . . . .	Sep. 28 . .	Recovered.
176	Neal, Mrs. M.	35	67	. . . . .	Sep. 15 . .	Recovered.
177	Neal, M.	50	67	. . . . .	Sep. 16 . .	Sep. 21 . .
178	Dill, Annie	27	150	. . . . .	Sep. 5 . .	Recovered.
179	Henderson, Emma . . .	17	150	. . . . .	Sep. 18 . .	Recovered.
180	Lacy, Miss.	33	150	. . . . .	Sep. 19 . .	Recovered.
181	Lacy, Susan	28	150	. . . . .	Sep. 18 . .	Recovered.
182	Lacy, Mrs.	68	150	. . . . .	Sen. 18 . .	Sep. 23 . .

Had been to Hickman previous to attack.
 Had been to Hickman previous to attack.
 Had not been to Hickman previous to attack. No others in the family.
 Removed to country September 6; had been in Lower Hickman August 26; family in country escaped attack.
 Was in town daily previous to attack.
 Four children were taken to the country (from 223 West Hickman), after J. C. J. was attacked, and escaped attack; these children had come in contact with other cases of yellow fever before going to country.
 Member of the Relief Committee; was in town previous to attack.
 } Were not in town previous to attack.
 Was in town daily previous to attack.
 Was in town daily previous to attack.
 Had both been in lower town several times between 1st and 10th of September; no others in family.
 Was in lower part of town September 3d and 4th, and previously.
 Was in lower part of town September 3d and 4th. None of the other members of family had been to lower town, it is stated, for some time previous to attack.

TABULATED STATEMENT OF YELLOW FEVER CASES AT HICKMAN, KENTUCKY—Continued.

No.	NAME.	Age.	Residence, No. of Lot.	Place of Business No. of Lot.	Date of Attack by Fever.	Date of Death.	Remarks.
183	Boudinot, Mrs. . . .	60	121	. . . . .	Sep. 14 . .	Recovered.	A daughter aged 30, who had bilious fever August 1, escaped attack.
184	Boudinot, William . . .	25	121	. . . . .	Sep. 13 . .	Recovered.	
185	Boudinot, Alice. . . .	22	121	. . . . .	Sep. 14 . .	Recovered.	
186	Wilson, Mrs. F. . . .	51	362	. . . . .	Sep. 18 . .	Recovered.	
187	Wilson, Charles	19	362	. . . . .	Sep. 21 . .	Recovered.	Mrs. W. had not been from home during the epidemic.
188	Wilson, Jennie	20	362	. . . . .	Sep. 19 . .	Recovered.	
189	Metheny, Minnie	11	77	. . . . .	Aug. 28 . .	Recovered.	Robert Metheny removed family to country September 5; he went into Hickman frequently; returned with family to his residence October 22; Minnie had been in lower town previous to attack; eight in family; others escaped attack.
190	Metheny, Robert, Jr. . .	6 w	77	. . . . .	. . . . .	Sep. 26 . .	
191	Metheny, Robert	40	77	. . . . .	Nov. 5 . .	Recovered.	
192	Vanderver, Mrs.	44	77	. . . . .	Oct. 31 . .	Nov. 3 . .	
193	McConnel, James. . . .	31	Country . .	. . . . .	Sep. 20 . .	Sep. 26 . .	Mrs. V did not go to lower town after return. Went into Hickman during the day with supplies; died in the country; family escaped attack.
194	O'Neal, Michael	22	Nurse in hos ^l	. . . . .	Sep. 19 . .	Sep. 25 . .	No family in Hickman.
195	Faris, Dr. Jas. W. . . .	30	Att'g the sick	. . . . .	Sep. 21 . .	Sep. 27 . .	When attacked went to Dr. Alexander's, where he died (see No. 127); removed family to Dr. Alexander's about September 22.
196	Mason, Mrs.	53	E. H.	. . . . .	Aug. 24 . .	Recovered.	Mrs. Mason went to lower town (remained during the day, lot 103) August 19.
197	Mason, James	21	E. H.	. . . . .	Sep. 17 . .	Recovered.	Jas. Mason went into town daily previous to attack.
198	Mason, Charlie. . . .	15	E. H.	. . . . .	Sep. 18 . .	Sep. 30 . .	Went to town previous to his attack.
199	Mason, Noah. . . .	11	E. H.	. . . . .	Oct. 3 . .	Recovered.	It is asserted that Noah Mason did not go to Hickman at all during the epidemic.
200	Monroe, Louis	26	W. H.	. . . . .	Sep. 13 . .	Sep. 17 . .	Sent family to country early before he was attacked; they escaped attack.
201	Kestners, Louis	30	85 W. H.	. . . . .	Sep. 21 . .	Recovered.	Assisted undertaker.
202	Kestners, Regina	59	85 W. H.	. . . . .	Sep. 30 . .	Recovered.	Had not been in town during epidemic; went to country about September 1; returned September 30, and was attacked same night.
203	Kestners, Addie	14	85 W. H.	. . . . .	Oct. 20 . .	Recovered.	Was in town daily previous to attack.
204	Kestners, Marcus. . . .	56	85 W. H.	. . . . .	Oct. 19 . .	Nov. 8 . .	

205	Lane, Life.	6	101 (Planter's House)	101	Sep. 23 . . .	Recovered.	Mrs. Lane was attacked with bilious fever about September 17, afterwards with yellow fever October 7; removed to West Hickman latter part of October, where youngest son Tom was attacked; several persons living in West Hickman came in contact with this boy during his illness and escaped attack.
206	Lane, T. J.	42	101	101	Sep. 26 . . .	Oct. 1 . . .	They were frequently in the lower town before attacked.
207	Lane, Henry.	4	101	101	Oct. 1 . . .	Recovered.	
208	Lane, Tom.	2	101	101	Oct. 30 . . .	Recovered.	
209	Lane, Mrs. T. J.	25	101	101	Oct. 7 . . .	Recovered.	
210	Creel, B.	19	101	101	Sep. 24 . . .	Recovered.	
211	Overton, Maggie.	22	101	101	Oct. 4 . . .	Oct. 8 . . .	
212	Sheron, Mrs. Catherine	59	358	358	Sep. 2 . . .	Recovered.	
213	Sheron, Joseph.	15	358	358	Oct. 1 . . .	Oct. 4 . . .	
214	Sheron, Tom.	18	358	358	Oct. 2 . . .	Oct. 6 . . .	
215	Sheron, Miss.	19	358	358	Oct. 6 . . .	Recovered.	
216	Bondurant, Jennie.	3	194 & 124 E. H.	194 & 124 E. H.	Sep. 24 . . .	Sep. 27 . . .	On September 1 family removed to vicinity lot 124; Mrs. B. and one child escaped attack; had not been to town
217	Bondurant, Mrs. J. C.	29	194 & 124 E. H.	194 & 124 E. H.	Sep. 27 . . .	Sep. 30 . . .	Volunteer physician from Henderson, Ky; sick at the residence of H. A. Tyler (Lot 383), where he was visited by his wife from Henderson; she escaped attack.
218	Bondurant, Albert G.	6	194 & 124 E. H.	194 & 124 E. H.	Sep. 27 . . .	Oct. 1 . . .	Spent the days in Hickman; remained with family in country, $\frac{3}{4}$ mile from town, at night, where he died; family escaped attack.
219	Cook, Dr. J. L.	..	118 E. H.	Att'g sick (1)	Sep. 26 . . .	Oct. 1 . . .	Neither had been to town for 2 or 3 weeks previous to attack; father and a brother, who attended them, and who went into town daily for medicines and supplies, escaped attack.
220	Buck, T. C.	62	Suburbs . .	1	Sep. 26 . . .	Oct. 2 . . .	Removed with family to country September 1; went into Hickman several times during the day; died in country; Mrs. Prather and child returned to the residence of J. A. Overton, 140 West Hickman, October 23; child escaped attack. (See Mrs. J. A. O., No. 260).
221	Glaser, Robbie.	7	253 W. H.	..	Sep. 27 . . .	Oct. 2 . . .	Dr. Corbett removed with family to suburbs, where he spent his nights; going to Hickman during the day; returned with family to home (118 East Hickman) about September 25.
222	Glaser, Joseph.	11	253 W. H.	..	Oct. 4 . . .	Oct. 10 . . .	Each member of family, excepting infant child, was in town every few days previous to attack; Mrs. Luttrell, the only member of family who escaped attack, was not in lower town after August 17.
223	Prather, Geo. B.	30	143 W. H.	1	Sep. 29 . . .	Oct. 2 . . .	
224	Prather, Mrs. Geo. B.	23	143 W. H.	..	Oct. 30 . . .	Recovered.	
225	Corbett, Mrs. W. D.	40	118 E. H.	..	Oct. 2 . . .	Oct. 8 . . .	
226	Corbett, Dr. W. D.	50	118 E. H.	Att'g the sick	Oct. 5 . . .	Oct. 11 . . .	
227	Corbett, child . . .	9	118 E. H.	..	Oct. 8 . . .	Recovered.	
228	Luttrell, Effie . . .	20	120 E. H.	..	Sep. 20 . . .	Recovered.	
229	Luttrell (infant child).	3 m	120 E. H.	..	Oct. 2 . . .	Oct. 6 . . .	
230	Luttrell, Fortleigh .	16	120 E. H.	..	Oct. 3 . . .	Recovered.	
231	Luttrell, Coppie . . .	18	120 E. H.	..	Oct. 6 . . .	Oct. 11 . . .	
232	Luttrell, J. L.	50	120 E. H.	..	Oct. 13 . . .	Recovered.	

TABULATED STATEMENT OF YELLOW FEVER CASES AT HICKMAN, KENTUCKY—Continued.

No	NAME.	Age.	Residence, No. of lot.	Place of Business No. of lot	Date of Attack by Fever.	Date of Death	Remarks.
233	Luttrell, Verona. . .	12	120 E. H.	Oct. 16. .	Recovered.	Left at beginning of epidemic; returned Sept. 20. Telegraph operator; came to Hickman Sept. 20. In Hickman previous to attack; Mrs. Wilburn es- caped attack; two others of family escaped attack. In Hickman previous to attack about October 4. In Hickman previous to attack. Volunteer physician from Louisville. Remainder of family escaped attack; had not been in town for 30 days previous to attack.
234	Luttrell, Mary. . .	2	120 E. H.	. . . . .	Oct. 23. .	Recovered.
235	Cobbs, Charles. . .	22	16 (Slept on	wharf-boat)	Sep. 30. .	Oct. 5. .	
236	Pollard, E. M. . .	19	16 (Slept on	wharf-boat)	Sep. 29. .	Oct. 5. .	
237	Wilburn, George. . .	50	223 W. H.	. . . . .	Aug. 25. .	Recovered.
238	Wilburn, Henry . . .	13	223 W. H.	. . . . .	Oct. 8. .	Oct. 13. .
239	Wilburn, T. F. . . .	23	223 W. H.	. . . . .	Oct. 10. .	Recovered.
240	Gober, Dr. D. . . .	51	383	Att'g the sick	Oct. 3. .	Recovered.	Remainder of family escaped attack; had not been in town for 30 days previous to attack. Removed family to country early; escaped attack. Nurse from Frankfort; no family in Hickman. Dr. A. went to town frequently to visit the sick, and remained with Dr. Corbett on the nights of 8th and 10th. Miss Belle went to town with him on October 12, and remained in town two hours; this was her only visit to Hickman during the epidemic. Had been in Hickman daily before attack; five in family; all escaped attack except two. Had not been in town during epidemic.
241	Barry, Mrs. John . .	40	E. H. (sub'bs)	. . . . .	Oct. 8. .	Oct. 19. .
242	Hertwick, Otto. . .	43	151	Undertaker.	Oct. 6. .	Recovered.	
243	Greenup, John . . .	30	Nurse in hos'l	. . . . .	Oct. 9. .	Oct. 13. .
244	Alexander, Dr. J. M.	61	10 miles in	country. . .	Oct. 12. .	Oct. 18. .	
245	Alexander, Belle. . .	19	10 miles in	country. . .	Oct. 15. .	Oct. 30. .	
246	Black, Joseph	20	101 W. H.	Oct. 18. .	Oct. 23. .	Went to town daily previous to attack. Went to town daily previous to attack. Chas. Cole went to town daily, and attended the sick at home; escaped attack. Went to Hickman daily previous to attack; two members of family escaped attack. Had not been to town previous to attack. Mr. Anderson went to lower town every day pre- vious to attack; Mrs. A. and daughter did not go to town.
247	Black, Mollie. . . .	15	101 W. H.	. . . . .	Oct. 1. .	Recovered.
248	Faris, Thomas. . .	25	101	. . . . .	. . . . .	Oct. 23. .
249	Faris, Dr. A. A. . .	. .	. . . . .	. . . . .	. . . . .	Recovered.
250	Cole, John.	14	W. H.	. . . . .	Sep. 24. .	Recovered.
251	Cole, Elizabeth. . .	40	W. H.	. . . . .	Oct. 1. .	Recovered.
252	Cole, Lush.	16	W. H.	. . . . .	Oct. 1. .	Recovered.
253	Cole, Catherine. . .	8	W. H.	. . . . .	Oct. 1. .	Recovered.
254	Cole, Lotta.	6	W. H.	. . . . .	Oct. 19. .	Oct. 25. .
255	Ringwood, John . . .	50	No. 222 W. H.	. . . . .	Oct. 5. .	Recovered.
256	Ringwood, Ellen . .	16	F. 222 W. H.	Oct. 5. .	Recovered.	Had not been to town previous to attack. Mr. Anderson went to lower town every day pre- vious to attack; Mrs. A. and daughter did not go to town.
257	Anderson, A. S. . . .	56	V. L. 122 E. H.	. . . . .	Oct. 19. .	Oct. 23. .
258	Anderson, Mrs. . . .	55	V. L. 122 E. H.	. . . . .	Oct. 22. .	Recovered.
259	Anderson, Mollie. . .	19	V. L. 122	. . . . .	Oct. 22. .	Recovered.

260	Overton, Mrs. J. A. . .	50	140 W. H.	. . . . .	Nov. 1 . .	Nov. 6 . .	Went to country September 1; returned to home (140 West Hickman) October 27; J. A. Overton remained in Hickman night and day during entire epidemic; sleeping at night on wharf-boat; he escaped attack.
261	McMahan, J. R. . . .	48	Suburbs . .	Suburbs . .	Nov. 3 .	Recovered.	Quarantined self and family at home half mile in country; after heavy frost October 28 went to town; went into stores just opened where fires had been made in stoves for first time since opening

(1). As there was an opinion prevailing at Hickman, during the summer of '78, that yellow fever was only contracted at night; also, that persons who slept in the upper stories of buildings were less liable to attack, I deem it worthy of note to call attention to several cases seeming to disprove the truth of this theory. Dr. Cook slept in the upper story of the residence (118 E. H.) on the bluff. It will be seen by reference to the map, that this building has an elevation of 440 feet above sea level. Persons living in the country, Miss Belle Alexander and others, came to Hickman during the day, believing that the risk was small. Miss Alexander's object in going into Hickman was to prevent her father from remaining there over night. The failure of prophylactics as a preventive will doubtless be referred to in Dr. Thompson's report.

(2). Information of the following cases was received too late for insertion in the tabulated statement: W. D. Taylor, attacked September 27, recovered; he moved family to country early, and wife returned October 14, and was attacked October 18; recovered; children remained in country, and escaped. The following persons remained at Hickman during the epidemic, and escaped attack: James A. Overton, R. Glaser, Charles Cole, John Ringwood, Jr., F. Berendes and family. The following came to Hickman frequently and escaped: Jeff. Alexander, M. D. Johnson, H. H. Harding, R. T. Tyler, W. W. Marshall, P. C. Greer, H. C. Bailey. There were several others, whites and negroes, but I have not obtained names. It is supposed by some that Henry A. Tyler had yellow fever; he was attacked about August 27, with what he and the attending physician supposed at the time to be malarial fever. As he was exposed to the yellow fever daily after his recovery, it has been thought that perhaps he had yellow fever. On account of the doubts I have not placed this among the cases in the tabulated statement.

(3). These tables are not presented as complete, but as much so as I have been enabled to make them from the insufficient data obtainable.

An analysis of the foregoing tables give the following results :

Total number of cases among the whites	262
Total deaths among the whites	131
Percentage of deaths	*50
Deaths in August	5
Deaths in September	87
Deaths in October	36
Deaths in November	3
Total males attacked	147
Total females attacked	115
Total deaths among males	89
Total deaths among females	42
Percentage of deaths to males attacked	60
Percentage of deaths to females attacked	36.5
Out of 94 male adults attacked 70 died—a percentage of 74.4.	

A study of the tables, with reference to the map, will show the spread of the fever. It will be observed that all of the persons attacked with fever in West Hickman, previous to September 27, had been east of Obion street previous to attack. As many as seven cases occurred in West Hickman after that date, of persons who had not been east of that street during the epidemic. In this way the approximated date of the spread of the fever upon the bluffs may also be determined.

I have endeavored to give such leading facts as may be most important in aiding others to study and draw conclusions from the epidemic at Hickman. My own knowledge and study of yellow fever is too limited to justify me in putting on record any opinions or conclusions I may have formed.

That the sanitary condition of a portion of the town under the bluff was bad there is no question, and the abstract proposition that bad sanitary conditions exaggerate most epidemic diseases may be true; but there are some facts connected with the history of this visitation of fever at Hickman which render arguments based upon the aggravation of the disease by these conditions somewhat hazardous. The sanitary condition of the Hendricks house and surroundings was no worse, not so bad, as many houses where the fever appeared later, and where it was not so fatal. The only family in Lower Hickman remaining through the epidemic, and escaping attack, was the Berendes family (Lot 22, map). The sanitary conditions of this house and its surroundings were exceptionally bad.

On one street (Carroll), as clean and well drained as could be desired, every man remaining—fifteen in number—had the fever, and eleven died. Every person remaining on this street had the fever excepting Mrs. Millet, who had fever in New Orleans in 1832.

*The death rate at Hickman, though large, was not so great as at some other places. At Memphis it was 66.6 per cent. among the whites; at Stoneville, Mississippi, it amounted to 72 per cent., including negroes.

That the fever did not prove as destructive on the bluff as in the lower town, may be accounted for by the fact that when it became epidemic on the bluff many of the inhabitants had fled; besides, the houses are farther apart, and the population more scattered than in the lower town. The sanitary conditions of Hickman were no worse than I saw, upon examination, in Cairo and Louisville, on my return from Hickman. That those cities escaped, and that the fever did not prove more destructive in the latter place, after its appearance there, must be attributed to other causes than superior cleanliness. It cannot be attributed to greater elevation above sea level. Broadway street, Louisville, at Louisville and Nashville depot, is 432 feet above sea level, and much of the city is below this level. Well authenticated cases occurred in East Hickman at an elevation above sea level of 440 feet.*

But a clean, well drained town ought to be better prepared against the ravages of any epidemic diseases than one lacking these safeguards; and as no town has greater facilities for thorough drainage than Hickman, by the construction of two or more main sewers in the lower town, into which lateral feeders may be conducted from the various squares, and an arrangement by which the water descending from the bluff and sloping streets will pass into and through these sewers, a good system of drainage can be had. Nature has placed within the limits of the town material from which admirable drain-pipe and sewers may be constructed. Excellent clay, from which drain-tile can be burned, is abundant. But as these can be purchased cheaply, it would hardly repay the outlay to obtain necessary machinery and kilns for burning, unless a permanent manufactory for the sale beyond the limits of the town was intended.

My opinion is, that the cheapest and best material for permanent drains is to be found in the bluff gravel, that being, beyond question, the finest ready-prepared concrete material I have ever seen.† The value of concrete in construction has been attested by the durability of structures erected centuries ago; and late experiments have proved, that where the materials for its construction are cheaply obtained, it is cheaper than stone or brick as a building material.

* Chattanooga, Tennessee, where there were 693 cases and 197 deaths, must have an average elevation above the sea of 700 feet. The low water mark of Tennessee river at that place is 643 feet above sea level. Chattanooga is *north* of the isothermal (56°) which passes through Frankfort, Louisville, and St. Louis.

† The uses of this material as a concrete building material, a street material, &c., will be treated of at length in the Economic Reports of the Geological Survey.

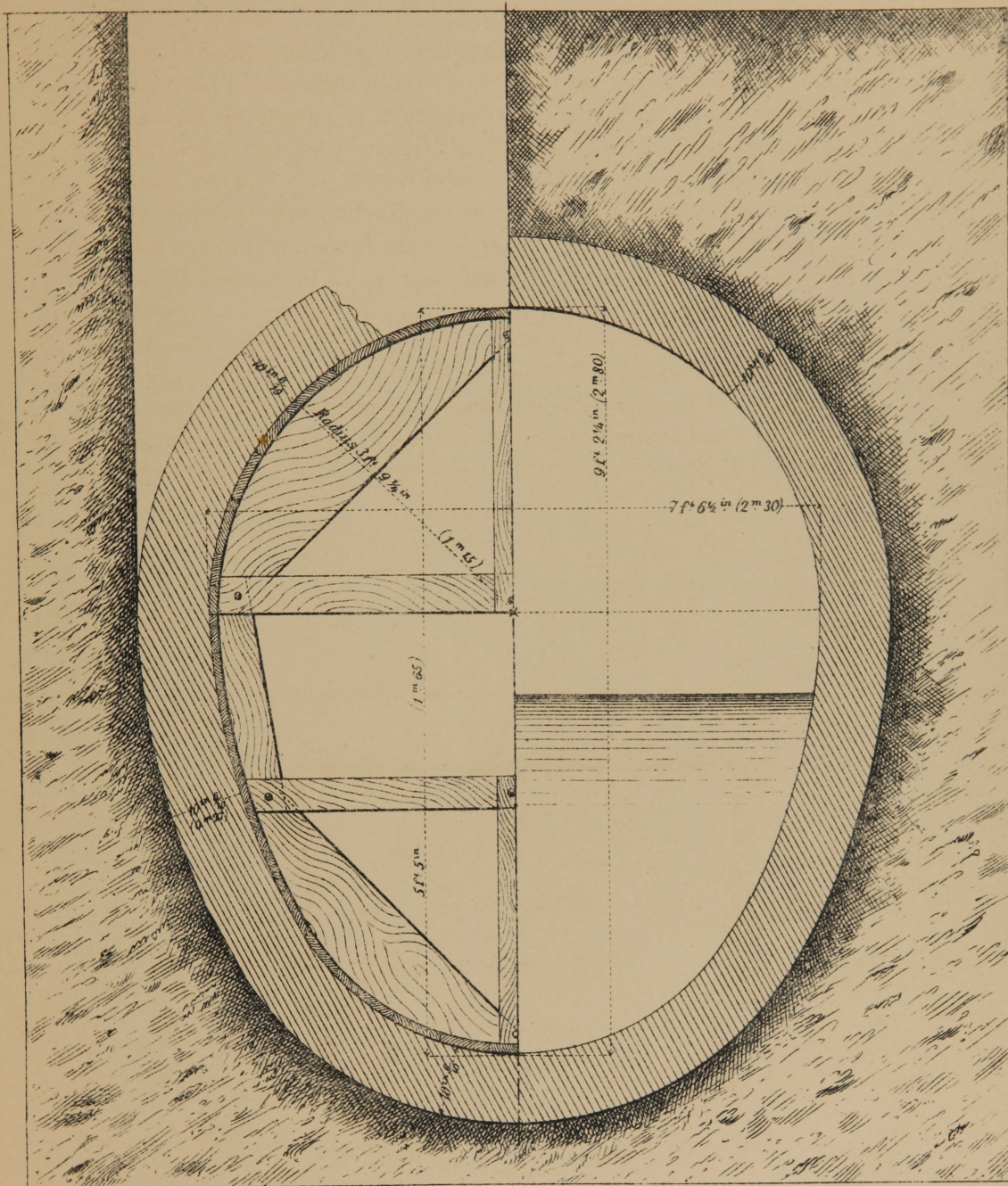
In France it is extensively used, under the name of *Béton-Coignet*,* in the construction of sewers, water-pipes, foundations, walls, arches, buildings, aqueducts, reservoirs, &c.

In Paris, over forty miles of sewers have been constructed of this material. The foundations, underground arches, drains, &c., both for the Exhibition buildings of 1867 and 1878, were of concrete. I have given a drawing showing the method of construction of one of the branch sewers in the city of Paris (Fig. 1, Plate II), and a smaller water conduit (Fig. 2, Plate II). Although the sewer here figured is larger than any required at Hickman, the method of construction may prove of value. A trench is cut the required size, upon the bottom of which a floor of *béton* is laid. A framework of timber and boards is introduced, such as would be used in the construction of a sewer of masonry. Around this the *béton* is dumped and packed by a common laborer. The wood-work is then removed, and the sewer is complete. For smaller sewers, such as would be required at Hickman, a cylinder or core of the requisite shape could be used, around which the concrete could be compacted. After which, the core could be drawn along, and the same operation repeated. Terra cotta side drains could be introduced whenever needed for lateral branches. In Paris it is known that building stone is abundant and cheap; yet *béton* sewers cost 30 per cent. less than stone, and much less for repairs. Water-pipes in Paris are constructed from this material at about one half the cost of iron. A sewer 5.5 feet high, 2.5 feet wide, and 7.8 inches thick, contains 11 cubic feet of concrete per linear foot of sewer. The value of concrete depends on the peculiar qualities of the materials used, and the careful manipulation of the same. The angular shape of the chert pebbles, and the quantity of large sharp sand in the Hickman gravel, render it peculiarly adapted to make a strong and durable structure. Either hydraulic or ordinary fat lime may be used for foundations; but for sewers, the former would be preferable. The gravel should be freed from all pebbles larger than one inch cube, which could be done cheaply by screening; then it should be moistened just sufficiently to cause the lime and cement to adhere. Over the mass the lime should be sifted, whilst the mass was stirred, so that a thin coating of the same would be on the pebbles and sand; the proportion of lime and sand to be determined by the character of the structure required. One part of Louisville cement to seven parts gravel and sand would make a durable and strong sewer.

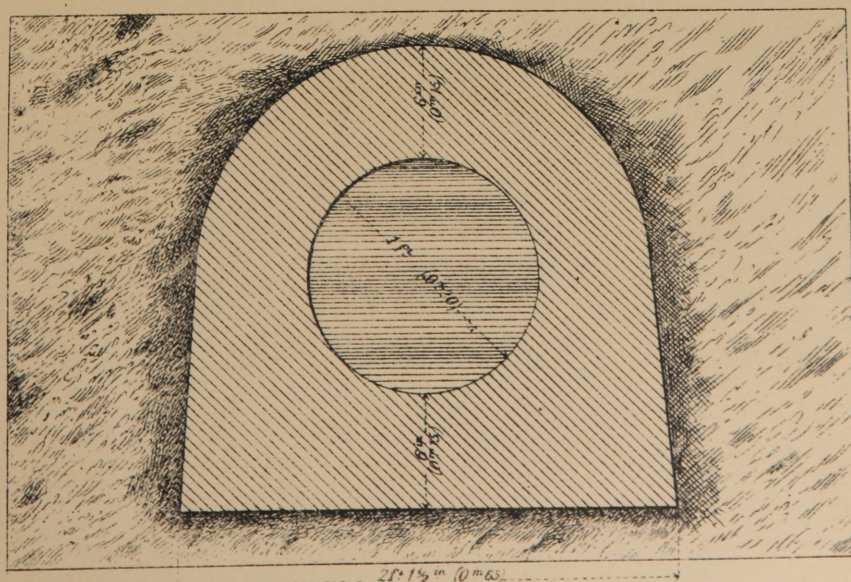
* So named after M. Coignet, the engineer who introduced the use of this material in France.

Construction of a Sewer of Béton. City of Paris.

scale $\frac{1}{25}$



Water Conduit scale $\frac{1}{10}$



I made blocks $3\frac{1}{2}$ inches cube of gravel from Hickman and Paducah, using in the various blocks Louisville cement, Portland cement, and ordinary quick lime. Blocks containing 1 part of Louisville cement to 7 sand and gravel, and blocks with 1 part quick lime to 8 gravel and sand, and $\frac{1}{2}$ of 1 part of Portland cement, withstood a crushing weight of from 11,000 to 12,000 pounds.* After drainage, I would recommend that areas be excavated back of the stores running through from Clinton to Jackson streets, and along the sides of the buildings between those streets fronting on Cumberland street.

For retaining walls to these areas, concrete from the same gravel can be used. Instead of hydraulic lime, quick lime will answer for these walls, although the former would be preferable. By sloping the bottom of these areas away from the buildings, and putting a drain on the lower side, the buildings will be rendered much dryer. I think it injudicious to use brick work in foundations, and for all buildings in the future, reliable and dry foundation can be had at much less cost from the gravel. Nearly all the heavy machinery at the Paris Exposition was placed on blocks of concrete. This gravel, when placed in a ditch and pounded, will be compacted mechanically into a hard block, and I believe will be a firm foundation for ordinary buildings without any addition of lime or cement. Of course, that portion of the foundation above the ground should be mixed with lime or cement.

I would also recommend that the present system of closets in the lower town be reorganized. I believe that unless an abundant supply of water and good drainage can be had, the present system of closet on top of ground is preferable to one with a pit, or even to the ordinary water-closet; but care should be taken that the surrounding ground be not contaminated, and that proper absorbents and disinfectants are used, so that the excrement be rendered harmless, and can be removed with ease. I will not recommend any of the earth closets, admirable as some of them are, for they are expensive, and, unless carefully cared for, defeat the objects for which they are designed. With the closets at present in use, inexpensive appliances can be adapted which will render them harmless.

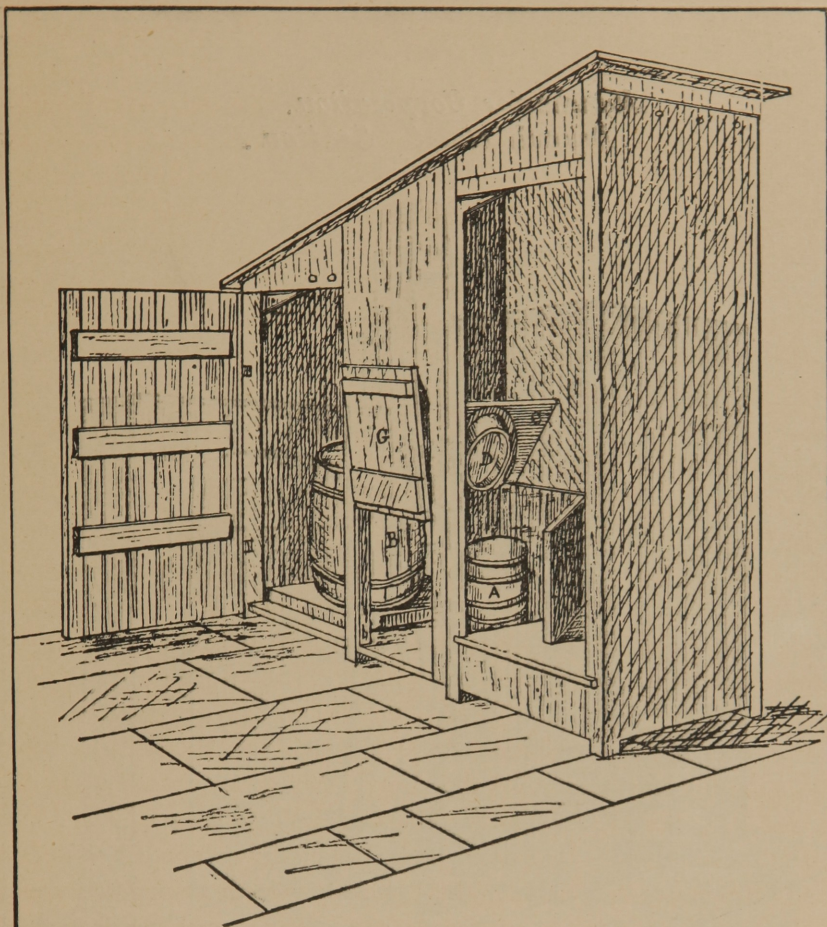
Through the kindness of Dr. Charles F. Folsom, Secretary of the Massachusetts State Board of Health, I have obtained plates of closets

*Should the authorities of Hickman, or of any of the towns in Western Kentucky, desire to use this gravel in the construction of sewers, foundations, or other purposes, specifications more in detail will be furnished upon application to the office of the Geological Survey.

used in England from which satisfactory results have been obtained. By reference to these plates, the reader, with the brief description which I have taken from the 1876 report of the Massachusetts Board of Health, can easily understand the construction of these closets. It will also be seen that these systems can be applied to the ordinary closets now in use. The Rochdale "pail closet," which has been in use since 1868, consists of an ordinary out of door closet, such as are in general use throughout this country, beneath the seat of which is placed a pail made from half a kerosene barrel. This pail is capable of holding one hundred pounds; the average weight of its contents, after a week's use by a family of ordinary size, was 41 pounds. In 1871, out of the 13,938 inhabited houses of Rochdale, 2,944 were fitted with the "pail closet," used by 11,770 persons. In 1874 the number of houses so fitted was 7,287, used by 43,500 persons. By the addition of ashes or dry pulverized earth, these pails can be removed without disagreeable effects, and a disinfected pail substituted. Under the old privy system, in Rochdale, the cost of removing the excrement of one thousand persons was £71 a year. Under the "pail closet" system it was £19; the resulting manure selling for three fourths the cost of collecting and preparing it. The very great advantages of this system are apparent.

The Manchester Corporation closet is much on the same principle, with an arrangement to apply the sifted ashes as an absorbent, as will be seen from the plate. The workings of both of these systems were carefully inspected, and reported favorably on, by competent officers of the British Boards of Health; the Rochdale system having the preference on account of its greater simplicity. The excrement from both systems, when removed, is composted into a marketable manure. The third plate represents a closet in use in the United States. It would be preferable to project the roof, making a shed under which ashes or earth could be kept dry, to be thrown into the pail whenever the contents should become offensive. The addition of a very small amount of dry powdered loam will instantly absorb all unpleasant odors in a privy on top of the ground. This same effect could be produced in the pails, if drainage from the bottom of the pail be provided, so that the contents be kept as dry as possible. By draining around the closet, so that the earth under it be kept dry, the liquid from the pail will be absorbed. The earth underneath might be removed for several inches in depth once a year, and replaced by fresh earth.

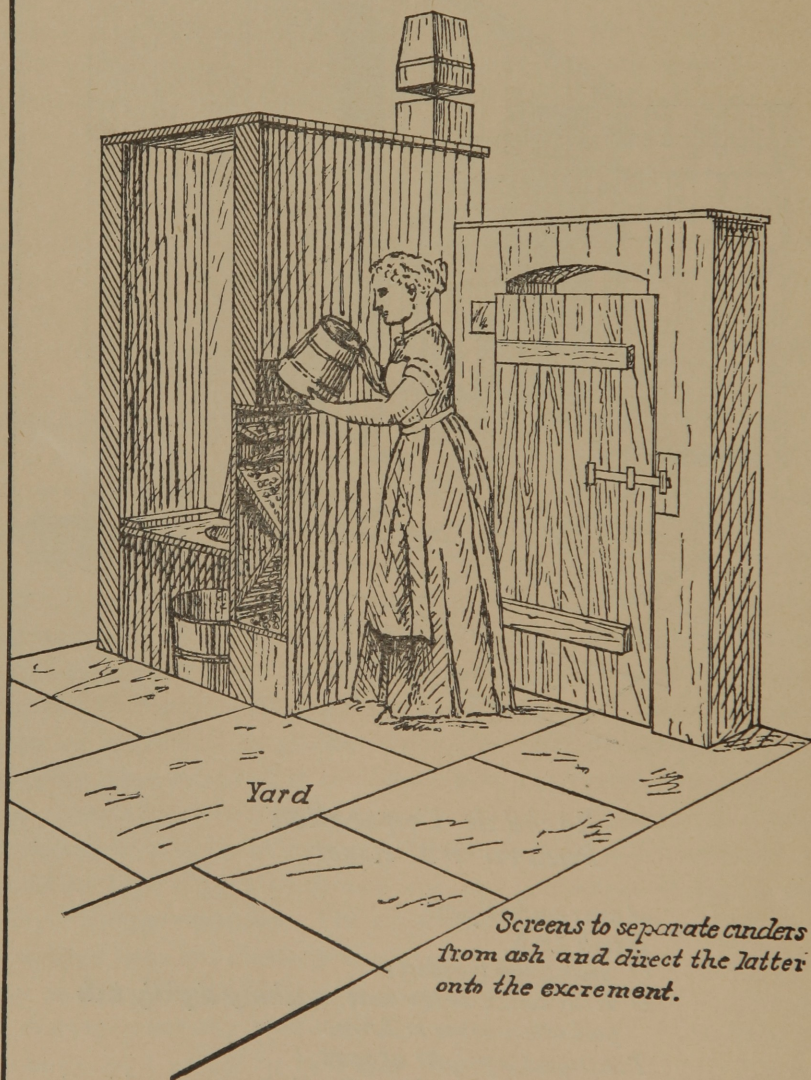
The superior properties of dry earth as an absorbent and disinfectant have been abundantly demonstrated. The loam of the Loess from the



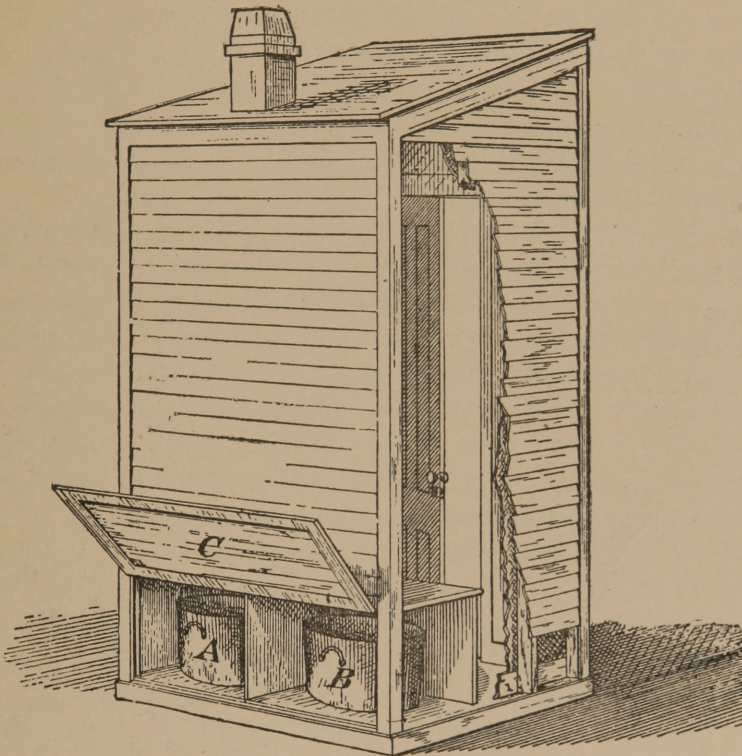
*Rochdale Corporation
Pattern Pail closet.*

- A. excrement pail.*
- B. wash tub.*
- C. seat cover (raised)*
- D. iron collar below seat, reaching slightly into pail when cover is down.*
- F. hinged upright of seat*
- G. door admitting from outside to excrement pail.*

*Manchester Corporation.
Dry ash closet. Section.*



upper part of the Hickman bluffs is peculiarly adapted to this purpose; having high absorbent properties, being finely pulverized, and can in all weathers be collected dry from the lower portion of the overhanging bluff above the town. The high percentage of lime adds to its value as a



CLOSET USED IN THE UNITED STATES.

A, excrement tub. B, tub of dry earth. C, hinged portion of back of closet.

disinfectant. Every family can, at nominal expense, be provided at all times with this loam, kept dry and ready for use, which will render harmless and inoffensive any closet in the place. If to this the pail system is added to facilitate removal, a great gain in cleanliness and comfort will be the result.

It is well known that malarial fevers are sometimes prevalent in the Mississippi river "bottoms," and a few suggestions may not be out of place in this connection, although they are not offered with the belief that they have any bearing on yellow fever. West of Hickman the

small creek, heading in the bluffs south of the town, widens into a marshy expanse. Were the waters retained at a constant level, no injurious effects would result. It is only after the summer heat has evaporated the water, and laid bare the decayed vegetation beneath, that malarial diseases result.* Until a system can be provided for keeping the water at one level, or the stream confined to a narrow channel, and the now marshy borders reclaimed by drainage and agriculture, it would be desirable for the health of the town that a skirting of timber, made dense by additional planting, be retained between the marsh and the town. It might not be labor in vain to add to this timber shield a skirting of sunflowers, both here and on the banks of the Bayou du Chien, above Hickman.

Prof. Maury was of the opinion that the planting of a few rows of sunflowers between the Washington Observatory and the marshy banks of the Potomac had saved the inmates of that building from the malarial fevers to which they had previously been subjected. This experiment was tried on the marshy borders of the Oglio, near Pisogne in Italy, with like results. It is asserted that one of the most malarious districts near Rome has been rendered salubrious by a young plantation of Eucalyptus. Similar results from the planting of this tree are reported from other parts of Italy and from Algeria and Louisiana.

† Marsh quotes from Becquerel's "*Des Climates*:" "It has been observed that humid air, charged with miasmata, is deprived of them in passing through the forest. Rigaud de Lille observed localities in Italy where the interposition of a screen of trees preserved everything beyond it, while the unprotected grounds were subjected to fevers."

The felling of a wood which had long stood between the village of Palo in Italy, and a malarious district south of it, was followed by widespread fevers in the village, which had previously been exempted from them. Similar phenomena have been observed in other parts of Italy.‡ Dr. Metcalf, in his report to the United States Sanitary Commission, says of malaria:

"5th. It has an affinity for dense foliage, which has the power of accumulating it when lying in the course of winds blowing from malarious localities.

* I learned of a striking instance in proof of this while in Western Kentucky in the autumn of 1877. I was told by a gentleman who had formerly lived on the borders of a large pond, ten acres or more, that, fearing malaria from the same, it being covered with a green scum, he drained it in midsummer, by cutting a trench—the work of a few hours; directly, within a few days, every member of his family were attacked with malarial fever. Previous to the draining, their health had been good.

† In his great work: "*The Earth as Modified by Human Action*" (New York, 1877).

‡ Other instances are given in F. B. Hough's "*Report on Forestry*," Washington, 1877.

"6th. Forests, or even woods, have the power of obstructing and preventing its transmission under these circumstances."

Other authorities might be cited, which the scope of this Report precludes.

The influence of the sun upon well-drained ground cannot be other than salutary; but I would recommend that, until the open squares, described on page 76, be drained, they be planted with some rapid growing plants. This will not only shield the decayed vegetation from the effects of the sun, but it will be a means of drying those squares. The quantity of water taken up and exuded by some plants is remarkable. For this purpose the sunflower would be a good selection. "A branch of *helianthus annuus* (sunflower), placed in a carafe full of water, and exposed to the sun, exhausts the water very rapidly."*

Dr. Asa Gray says: "The quantity of water exhaled from the leaves during active vegetation is very great. In one of the well known experiments of Hales, a sunflower three and a half feet high, with a surface of 5,616 square inches exposed to the air, was found to perspire at the rate of twenty to thirty ounces avoirdupois every twelve hours, or seventeen times more than a man."

I believe the caving in of the river banks in the spring, thus baring to the rays of the summer sun the decayed vegetation so abundant on the alluvial banks of the Mississippi, may be a cause of malaria. Of the numerous suggestions to guard against this, I think the most inexpensive, and at the same time the most effective, would be to construct rafts of cottonwood, or other cheap timbers; load these rafts with stone, and anchor them into the quicksand at low water, wherever the river impinges against the bank. Where I have noticed the banks of this river there is an unstable, semi-fluid quicksand at low water. The current is constantly cutting into this, which causes the overhanging banks to fall: then the process is repeated. The rafts embedded in the quicksand, taking the slope of the bank, would offer a barrier, and prevent the cutting under of the river. If, in addition, willows were planted and cared for, and long-root grasses adapted to such soil, a bank which would resist the encroachments of the river might be the result.

I have made the above suggestions, believing that the execution of such a system of sanitary reform would promote the healthfulness of the town. That it will have any effect in preventing a recurrence of yellow fever, or in moderating its virulence, I have no opinion.

* Marshal Villant, quoted by J. Crombe Browne "*Forests and Moisture*," Edinburg, 1877.

As a means of preventing a recurrence, I have but one recommendation, which is, I believe, the one universally agreed upon—a rigid quarantine, allowing no boat from an infected district to come within five hundred yards of the shore, and compelling all railway cars from roads running through such districts to stop outside of the town limits. The most, and probably the only, successful mode of combating this fever, after it has made its appearance in a place, is by depopulating the place, and scattering the inhabitants throughout the country. By the use of freight cars as temporary houses, and the tents and camp outfit belonging to the Quarter-Master's Department of the State, a town the size of Hickman could be depopulated in a few days, and the people cared for in small camps until such as could afford it could seek accommodations in towns and farm-houses.

When yellow fever invades a State I see no reason why it should not be declared a public enemy; and, if necessary, arbitrary measures taken to combat it.

I regret that the scope of this Report precludes me from expressing at length admiration for the men who have brightened the otherwise all-pervading gloom of this epidemic by their heroic philanthropy. We justly admire our military heroes, but we should remember that such admiration for warlike fame is the remnants of the savagery which centuries of civilization have not yet eliminated from our race, and that a higher heroism is theirs who go into the Valley of Death with no blare of trumpets nor flaunting of banners, and battle with an unseen foe, terrible beyond conception. No page in Kentucky history will be brighter than that recording in simple language the story of the Heroes of Hickman.

APPENDICES.

APPENDIX A.

CHEMICAL LABORATORY KENTUCKY GEOLOGICAL SURVEY, }
LEXINGTON, KY., January 20, 1879. }

John R. Procter, Esq.:

DEAR SIR: I have examined the four samples of cistern water from the city of Hickman, Fulton county, Kentucky, sent by you to the laboratory for analysis, and now give you the results.

Sample 1.—Labeled "Water from Cistern (21), in plot of Hickman;"* contained in a green pocket flask; cork not tight; smelt of rotten wood, and was of a decided light-brownish color.

Sample 2.—"Water from Cistern (22), plot of Hickman," &c., in white quart pocket flask, with a common cork; smelt strongly of rotten wood, and was also of a decided light-brownish color.

Sample 3.—"Water from Cistern (28), plot of Hickman," &c.; also contained in a flat, white pocket flask, with common cork; smelt also of rotten wood, and was of a light-brownish color.

Sample 4.—"Water from Cistern (25), plot of Hickman," &c.; in a green, flat patent medicine flask; with common cork; had *no color*, and only a slight odor of camphor—doubtless derived from the bottle.

Each of these waters gave a slight *alkaline reaction*, both in the original water and in the solid saline residue obtained by evaporation.

Evaporated to dryness, these waters gave of solid *saline residue*, dried at 212° F., to the 1000 *parts*, the following stated quantities, viz:

- No. 1 gave 0.84 of a light-brownish tint.
- No. 2 gave 0.87 of a light-brownish tint.
- No. 3 gave 0.44 of a light-brownish tint.
- No. 4 gave 0.47 perfectly white.

Qualitatively tested for nitrates and nitrites:

- No. 1 gave a decided reaction.
- No. 2 gave a slight reaction.
- No. 3 gave a decided reaction.
- No. 4 no reaction.

Distilled with the addition of ignited sodium carbonate, until about one third passed over, the distillate being received in diluted chlorohydric acid, and the resulting ammonia estimated as chloride of platinum and ammonium, the several waters gave the following result, as calculated in the *million parts* of the water:

- No. 1 gave 1.2 parts of ammonia to the million.
- No. 2 gave 3.63 parts of ammonia to the million.
- No. 3 gave .60 parts of ammonia to the million.
- No. 4 gave .60 parts of ammonia to the million.

(* See Plate I.)

The residue in the retort was again distilled, after an addition of caustic soda and potassium per-manganate, the object of which is to convert into ammonia the combined nitrogen of any organic compound present which may have resisted the action of the sodium carbonate. The result was as follows :

No. 1 gave 1.45 parts of albuminoid ammonia to the million of the water.
 No. 2 gave .45 parts of albuminoid ammonia to the million of the water.
 No. 3 gave .97 parts of albuminoid ammonia to the million of the water.
 No. 4 gave .73 parts of albuminoid ammonia to the million of the water.

The waters, caustic soda having been added, were then titrated with a normal solution of potassium manganate; to ascertain how much oxygen was required to *oxidate the organic matters* they severally contained. The following results were obtained :

No. 1 required 35.2 parts of oxygen to the million of water.
 No. 2 required 20.8 parts of oxygen to the million of water.
 No. 3 required 13.6 parts of oxygen to the million of water.
 No. 4 required 1.6 parts of oxygen to the million of water.

As a sufficient quantity of the waters had not been supplied for complete *quantitative* analysis, they were simply *tested* for their saline ingredients, with the following results :

	Chlorine.	Sulphuric acid.	Lime.	Magnesia.	Iron.	Phosphoric acid.
No. 1.	much.	much.	considerable.	little.	trace.	a marked trace.
No. 2.	do.	do.	do.	do.	do.	not tested.
No. 3.	do.	do.	do.	do.	do.	a marked trace.
No. 5.	trace.	trace.	do.	do.	none.	not tested.

It is evident, from these experiments, that waters Nos. 1, 2, and 3 give decided evidence of containing impure materials, probably derived from the infiltration of city drainage into the cisterns (21), (22), and (28); while the water of cistern (25), measurably free from this contamination, gave 0.73 per million of albuminoid ammonia. It also contains *saline matters* which may have been derived from the surrounding subsoil, by influx of surface spring waters or otherwise. These saline matters, however, are not at all injurious to health; but the organic and other nitrogenous materials, derived from drainage, although taken into the animal body in very small quantities at a time, are found, by experience, not only to induce grave disorders of the system, but greatly to increase the mortality of existing epidemics when habitually taken in the daily drink.

According to the experiments of many skilled observers, rain-water always contains more or less ammonia, as well as nitrates and nitrites. Organic matters, also, in the form of microscopic spores and dust, are

always to be found in the atmosphere at ordinary levels. These ingredients, which are in larger proportion in cities than in the open country, are brought down continually in the rain and snow which fall through the atmosphere.

Boussingault found in recent snow-water, in the country, only 0.17 part of ammonia in a *million*; in rain-water in the country 0.79; in rain-water in Paris, 4.00; while Bineau found in rain-water which fell in the city of Lyons, 16. parts in the million.

Indeed, the water which falls in large and crowded cities has been found to be unsafe in hot weather, because of its contamination with organic matters; and experience has led to the conclusion, that any water which contains more than 0.15 part of "albuminoid nitrogen" to the million is unfit for drinking.

Now, on reference to the preceding statements, it will be seen that all these four waters gave a notable quantity of "albuminoid ammonia;" and when we calculate the amount of nitrogen contained, we shall see that even the water No. 4 holds much more than is said to be compatible with safety in drinking water; thus:

Water No. 1 contains 1.20 parts of nitrogen per million.
Water No. 2 contains .37 parts of nitrogen per million.
Water No. 3 contains .80 parts of nitrogen per million.
Water No. 4 contains .60 parts of nitrogen per million.

Another circumstance pointing to drainage contamination is, that waters Nos. 1, 2, and 3 contain a large proportion of chlorine compound.

All things considered, although the limit of safety in drinking water, fixed at 0.15 of albuminoid nitrogen to the million, may have been much misplaced toward the safe side, yet it seems evident that at least three of these waters, Nos. 1, 2, and 3, are too much contaminated to be wholesome; and further, it is very probable that they may, by continued use, not only cause disease, in hot weather especially, but greatly increase mortality in times of epidemics or endemics.

Yours, &c.,

ROBERT PETER.

NOTES TO TABLES IN APPENDIX B.

(1.) The John D. Porter arrived at New Orleans July 16th, and remained until the 18th, several days after the yellow fever had appeared in that place. Fever made its appearance among the crew as early as the 19th. See history of the Jno. D. Porter, and the cases of fever on board. Dr. Minor's Report on "Yellow Fever in Ohio."

(2.) Courier-Journal River News, July 29: "The John Porter and tow from New Orleans passed Helena Saturday evening (July 27th), with a canvas over her name. It is reported she had several cases of yellow fever aboard."

(3.) Cairo Bulletin, August 1, has the following: "The long-looked for and much-dreaded John Porter, which has been reported a floating pest-house, came up from New Orleans. The tug met her at the mouth of the river, and our city fathers and medical adviser boarded her, and found her in a healthy condition. They gave her permission to land, and so ends the much talked of yellow fever scare."

The Porter remained at Cairo until August 1.

(4.) "The Commonwealth, in passing Memphis, put off two men that were sick. The swamp or malarial fever is doing its work among the lower river boat crews."

(5.) Golden Crown arrived at New Orleans night of July 23, where she remained until the afternoon of the 27th.

Impossible to arrive at the number of deaths to this date, as the facts were concealed at the time. The report of the Louisiana Board of Health for 1879, gives the total deaths in July at twenty-six.

(6.) Courier-Journal River News, Louisville, August 9th: "The Golden Crown and two barges passed up from New Orleans yesterday. No 'yellow jack' aboard."

(7.) The Golden Rule arrived at New Orleans, August 9th, and departed next day. The yellow fever had been epidemic in that city for almost a month previous to this date, as will be seen by the reports of the Louisiana State Board of Health.

The Golden Rule landed at the foot of Fourth street, Louisville, August 19th, at 1 P. M. Was boarded by the Mayor and Health Officer of Louisville, who reported three men prostrated with intermittent fever. The sick on the boat were also examined by surgeons from the U. S. Marine Hospital, who pronounced the cases intermittent fever.

The Mayor prevented the unloading of freight from the boat. Range of thermometer from 7 A. M. until 10.25 P. M., that day, 82°, 92°, 95°, 94°, 78°, 77°; weather cloudy; wind S. and S. W.; brisk.

The Golden Rule reached Cincinnati quarantine station August 20. Six cases from the boat were admitted to the yellow fever hospital at Cincinnati; all of them pronounced to be yellow fever by Dr. Minor, Health Officer of Cincinnati. See report of these cases in Dr. Minor's report on "Yellow Fever in Ohio," pages 45, 46, and 47.

(8.) "John A. Scudder from New Orleans to St. Louis. Owing to sickness on board, the Captain refused to take passengers at Memphis."

(9.) Scudder did not land at Cairo. I do not know whether she landed at Hickman; must have passed there on the morning of August 9.

In addition to the boats given in the tabulated statement, the following passed north from New Orleans, and one or more may have landed at Hickman:

The Port Eads and barges passed Vicksburg July 25th, and again, on second trip, August 15th.

Gold Dust passed Memphis night of August 5th.

Paris C. Brown passed Memphis August 8th.

Grand Lake and barges left New Orleans for St. Louis August 6th.

Belle of Shreveport left New Orleans for St. Louis August 7th.

The John D. Porter arrived at the foot of the canal below Louisville on August 12th, and remained at the mouth of the canal all day, and passed through at midnight, landing at the foot of Sixth street. A man (Mike Mohannon) attempted to prevent the boat from landing; failing in his attempts, he ran to the Central Police Station and demanded the Health Officer; was informed by the Station Keeper that the Health Officer could not be found at that time of night, and that nothing could be done. It is not known how long the Porter remained at Louisville, as no notice of her departure was given. At this time eleven of the crew were reported to have had the disease, four of whom had died. Some of the crew became alarmed, and left the boat at Louisville, and new men were hired in their places. The following meteorological record, from the U. S. Signal Service reports, may be of interest in this connection:

METEOROLOGICAL RECORD, LOUISVILLE, KY.

TIME OF OBSERVATION.	Thermometer.	Barometer (corrected readings).	Relative humidity.	Wind.	Velocity miles per hour.	State of weather.
				Direction of.		
August 12— 7 A. M. . .	71	29.964	71	N.	6	Clear.
11:25 A. M. . .	82	29.931	39	N. W.	5	Hazy.
2:00 P. M. . .	86	29.892	33	N. W.	6	Hazy.
4:00 P. M. . .	85	29.848	38	N. W.	6	Fair.
9:00 P. M. . .	78	29.871	57	N. W.	1	Fair.
10:25 P. M. . .	76	29.879	56	N. W.	4	Clear.
August 13— 7 A. M. . .	71	29.877	66	N.	6	Hazy.
11:25 A. M. . .	84	29.860	37	N.	5	Fair.
2:00 P. M. . .	85	29.826	32	N. W.	5	Clear.
4:00 P. M. . .	86	29.774	30	N. W.	5	Clear.
9:00 P. M. . .	78	29.827	57	N. W.	2	Clear.
10:25 P. M. . .	75	29.839	64	N. W.	1	Clear.

August 14. Thermometer for same hours was: 72°, 84°, 88°, 88°, 74°, 73°.

August 15. Thermometer for same hours was: 72°, 88°, 89°, 88°, 76°, 74°.

August 16. Thermometer for same hours was: 79°, 88°, 90°, 90°, 83°, 80°.

STATEMENT

Showing the Mean Monthly Temperature, Mean Monthly Barometer, and Total Amount of Precipitation, which fell at Cairo, Ill., during the months of June, July, August, and September, 1878, as recorded at the Station of Observation of the Signal Service U. S. A. in that city, compiled from the records on file at the office of the Chief Signal Officer U. S. A., at Washington, D. C.

1878.	CAIRO, ILL.				
	Mean Temperature.	* Mean Barometer.	Amount of Rainfall in inches.	Wind.	
				Prevailing direction during month.	Number of miles traveled during the month.
June	76.4	29.949	4.61	S.	4,402
July	83.7	29.969	2.81	N.	3,207
August	82.1	29.924	3.45	S. W.	3,822
September	72.0	30.022	2.95	S.	5,197

* Corrected for temperature, instrumental error, and elevation.

WAR DEPARTMENT,
OFFICE OF CHIEF SIGNAL OFFICER,
WASHINGTON, D. C. }

APPENDIX C.

[See Nos. 105, 106, and 107, Tabulated Statement, page 15.]

NASHVILLE, TENN., April 12, 1879.

JOHN R. PROCTER, ESQ., *Frankfort, Ky.* :

DEAR SIR: Yours of 8th inst. is just at hand, concerning the Reed family, refugees from Hickman, Kentucky, last September, on account of the yellow fever outbreak. They arrived in Nashville, after dark, on the 6th of September, five in number, Mr. Reed, lady, and three children—nursing infant about eight months old, a boy about three years old, and one about five years old; found lodging in a closely packed boarding-house, and a thickly settled neighborhood, indeed every room in the badly ventilated house had several occupants.

On the 7th inst. Mrs. Reed sickened with symptoms of yellow fever, and developed a well marked severe type of the disease. In about five days Mr. Reed was attacked with similar symptoms, with clinical history of yellow fever well marked. Both patients recovered. No *black vomit* with either. About nine days after their arrival here the three-year old boy was taken. After severe fever for four days, there was a general subsidence of active symptoms, with marked exhaustion. In eighteen to twenty hours, after this class of symptoms set in, *black vomit* supervened, and patient died in about four hours. There was no extension of the disease, though several lady boarders were in the room to assist in the nursing. The infant of Mrs. Reed was nourished from her breast all the time she was laboring under the fever, without contracting the disease. The baggage of this family was in the same room and adjoining hall. The immediate sanitary surroundings were bad, yet there was no spread of the disease from this focus. Nor was there, in any instance, any spreading of the disease among the citizens of Nashville from the many cases of refugees occurring here. There were other cases from Hickman, but I do not call definitely to mind, if any others from that locality fell to my care.

Very truly, &c., yours,

THOS. L. MADDIN.

